DRYDEN

CONTRACT FOR

SOUTH VAN HORNE
HOUSING ENABLING PROJECT

CONTRACT NO. T-2026-1

Prepared By:

Stantec

January 2026

TENDERER'S CHECK LIST

Before submitting your tender, check the following points:

1.	Has your tender been signed, sealed and witnessed?	( )
2.	Have you enclosed the Tender Deposit, i.e. certified check or bid bond?	( )
3.	Have you enclosed the Agreement to Bond, signed and sealed by your proposed Surety?	( )
4.	Have you completed all schedules and prices in the Tender Form?	( )
5.	Have you indicated and included the Contingency Allowance in the Form of Tender?	( )
6.	Have you indicated the number of addenda included in the tender price?	( )
7.	Have you completed the Undertaking to Comply with the City of Dryden's Policy on Contractor Safety?	( )
8.	Have you signed the "Accessibility for Ontarians with Disabilities Act form?	( )
9.	Have you listed your Sub-Contractors and major suppliers? (if applicable)	( )
10.	Have you listed your Experience in Similar Work?	( )
11.	Have you listed your Senior Staff?	( )
12.	Have you listed the Tenderer's Plant? (if applicable)	( )
13.	Have you completed Tendering Statements "A" to "G"? (if applicable)	( )
14.	Are the documents complete?	( )

LIST OF CONTRACT DOCUMENTS

00900 Addenda _____ to _____ inclusive
00100 Information to Tenderers
00300 Tender Form
00310 Agreement
00610 Agreement to Bond (CCDC 220)
00620 Undertaking to Comply with City of Dryden Policy on Contractor Safety
00625 Accessibility for Ontarians with Disabilities Act, Reg. 429/07
00630 Form of Certificate of Insurance
Tenderer's Experience in Similar Work – Statement "A"
Tenderer's Senior Supervisory Staff – Statement "B"
Tenderer's Construction Plant – Statement "C"
Subcontractors and Suppliers Statement "D"
Sources of Granular Materials, Concrete and Asphalt – Statement "E"
Performance Parts of the Work – Statement "F"
Schedule of Equivalents – Statement "G"
00800 Supplementary General Conditions
01000 General Requirements
01001 Special Provisions
01561 Environmental Protection
02510 Roads, Sidewalks & Appurtenances
02520 Excavation and Grading
02530 Landscaping
02555 Concrete Structures
02570 Excavation and Backfill of Trenches
02575 Storm and Sanitary Sewers
02580 Watermains
02585 Cathodic Protection for Watermains
02590 Sanitary Forcemains

Lift Station:
03 10 00 Concrete Forming and Accessories -23
03 20 00 Concrete Reinforcement
03 30 00 Cast-in-Place Concrete
03 48 00 Precast Concrete Specialties
05 50 00 Metal Fabrications
10 40 00 Safety Specialties
10 90 00 Miscellaneous Specialties
25 05 00 Common Work Results – Integrated Automation
25 14 23 Field Equipment Panels
25 30 01 Process Controllers
25 30 04 I/O Check Sheets
26 05 00 Common Work Results – Electrical
26 05 21 Wire and Cable (0-1000V)

26 05 26 Grounding and Bonding for Electrical Systems
26 05 29 Fastenings and Supports
26 05 23 Outlet Boxes, Conduit Boxes and Fittings
26 05 33 Wire and Box Connectors
26 05 34 Conduit, Conduit Fastenings and Fittings
26 05 43 Installation of Cable in Trenches
26 27 26 Wiring Devices
26 28 16 Circuit Breakers
26 29 10 Motor Starters to 600 V
26 43 13 Surge Protective Device
40 05 00 Common Work Results for Process Integration
40 05 60 Process Valves
40 20 00 Process Piping Materials and Methods
40 21 00 Submersible Solids Handling Pumps

Drawings:

Title Page
C-100 – Existing Conditions, Erosion Control and Removals Plan Van Horne 0+000 to 0+600
C-101 – Existing Conditions, Erosion Control and Removals Plan Van Horne 0+000 to 0+348
C-200 – Plan and Profile Van Horne 0+000 to 0+300
C-201 – Plan and Profile Van Horne 0+300 to 0+600
C-202 – Plan and Profile Van Horne 0+600 to 0+876
C-202B – Plan and Profile Van Horne Lift Station
C-203 – Plan and Profile Claybanks Rd. 0+000 to 0+348
C-300 – Details and Notes
C-301 – Details and Notes
C-302 – Details and Notes
C-303 – Details & Notes
C-400 – Pavement Markings and Signage Van Horne 0+000 to 0+600
C-401 – Pavement Markings and Signage Van Horne 0+600 to 0+876, Claybanks 0+000 to 0+348
D-101 – Process Proposed Lift Station Plans and Section
D-501 – Process Proposed Lift Station Plans and Section
E-101 – Electrical Lift Station Site Plan and Panel Details
E-102 – Electrical Lift Station Section and Schedules
E-601 – Electrical Single Line Diagram
E-602 – Electrical Power and Control Wiring Diagram
E-603 – Electrical Control Wiring Diagram
E-604 – Electrical Control Wiring Diagram and Panel Layout
S-001 – Lift Station Structural General Notes and Concrete Pads
S-101 – Process Proposed Lift Station Plans and Sections

City of Thunder Bay Standard Drawings:

S-100
S-107
S-113
W-100
W-104-1
W-115
W-130

Ontario Provincial Standard Drawings:

216.021
219.110
219.180
310.020
310.033
310.039
400.090
400.010
600.100
600.040
604.010
605.010
608.010
701.011
705.002
705.010
705.020
987.110
1105.010
1109.030

Current editions of Ontario Provincial Standard Specifications, and MOE, AWWA, CSA, ASTM Standards referenced in the Project Specifications. List of drawings may not be a complete list, and other drawing or specifications may be relevant.

SECTION 00100 - INFORMATION TO TENDERERS

1.1 TENDERS

Sealed tenders clearly marked as to contents, will be received for:

SOUTH VAN HORNE HOUSING ENABLING PROJECT

CONTRACT NO. T-2026-1

The City will only accept Electronic Bid Submissions through the City's website (Bidding System) at:

https://forms.dryden.ca/Bids-and-Tenders/Bids-and-Tenders-Submissions

Bid's must be received no later than 3:00pm local time on:

WEDNESDAY, FEBRUARY 25, 2026

The closing time and date shall be determined by the Bidding System clock. Tenderers are cautioned that the timing of their bid submission is based on when the bid is received by the Bidding System, not when a bid is submitted, as bid transmission can be delayed due to file transfer size, transmission speed, etc. It is recommended that sufficient time be factored into complete and electronically submit a bid to resolve any issues that may arise.

Any issues related to the City's website should be directed to the City's representative Madhav Raithatha at mraithatha@dryden.ca.

Submissions through facsimile, hardcopy or telephone will not be accepted or permitted.

Tenderers may edit or withdraw a bid submission prior to the closing time and date; however, the Tenderer is solely responsible to ensure the re-submitted bid is received by the City prior to the closing time and date.

Send an email to the City Clerk Allyson Euler at aeuler@dryden.ca to request confirmation that the bid has been received.

1.2 FORM OF TENDER AND CONTRACT FORM

Use (a) or (b) as appropriate.

.1 (a) Tenders must be completed electronically.

.2 Each tender shall include the completed copies of each of the following:

.1 Schedule of Pricing (excel format),
.2 Agreement to Bond,
.3 A tender deposit.

.3 The Tenderer will submit supplemental information to the Tender that will be used in the evaluation of the Tender, as follows:

.1 Statements "A" to "G"
.2 Project Specifications, if bound in a separate document, need not be submitted with the Tender; however, the Tenderer accepts and acknowledges by his provision of a Tender that he has read and understood all of the requirements of the Contract Documents.
.3 The Tenderer shall give the Total Tender Price both in words and figure and shall fill in all blank spaces for figures and shall fill in all blank spaces for unit prices, item prices, lump sums and other information in the Tender Form and in the Schedule of Tender Prices.
.4 Tenders submitted by facsimile, telex, or telegraph will not be considered.

1.3 TENDER DEPOSIT

Each Tenderer shall include a tender deposit in the form of a digital Bid Bond from a recognized guarantee or surety company acceptable to the City and authorized by law to do business in the Province of Ontario. Bids bonds shall be payable to the City of Dryden in the amount of 10% of the total tendered price.

Bid Bonds shall be uploaded with the Tender Submission on CCDC Form 220 or alternate approved bonds forms with the same format and content of the CCDC Form.

The tender deposit shall be in digital format. Scanned pdf or unverifiable bonds are not acceptable. All instruction details for accessing authentication should be included with the up-loaded bond.

Tenderers and the tenderer's surety should refer to the e-bonding information on Surety Association of Canada's website. Information at this site includes:

- A list of third parties that provide online surety digital bond services.
- An industry checklist which digital bonds provided should meet.

Should the successful Tenderer fail to enter into a Contract with the Owner or fail to produce the required Performance and Labour and Materials Payment Bonds

within two (2) weeks of the date of acceptance of the Tender, or to start work as directed, the tender deposit will be forfeited to the Owner.

1.4 DISQUALIFICATION OF TENDERS

Under no circumstances will tenders be considered which:

(a) Are not submitted electronically to the email address in Section 1.1.
(b) Are received after the above-advertised closing time for tenders.
(c) Are not accompanied by a Digital Bid Bond in the amount specified.
(d) Tender Form is not completed in excel format.
(e) Unauthorized changes made to the item descriptions, quantities, and items listed in the Schedule of Pricing (excel file).

1.5 INFORMAL OR UNBALANCED TENDERS

Tenders which are incomplete, conditional, illegible or obscure or that contain additions not called for, reservations, erasures, alterations, or irregularities of any kind, may be rejected as informal.

Tenders that contain prices, which appear to be so unbalanced as likely to affect adversely the interests of the Owner, may be rejected.

The City reserves the right to waive informalities at its discretion.

Tenderers who have submitted tenders that have been rejected by the City because of informalities will normally be notified of the reasons for the rejection within 10 days after the closing date of tenders.

1.6 SUBSEQUENT WITHDRAWAL OR QUALIFYING OF A TENDER

A Tenderer who has already submitted a Tender may withdraw its submission, make necessary changes and resubmit its Tender before the official closing time.

1.7 TENDER VALIDITY

This Tender shall constitute an irrevocable offer by the Tenderer, open for acceptance by the Corporation of the City of Dryden for a period of 60 days, after which time, if not accepted; the Tender shall be null and void. It is understood that errors in the Tender, whether accidental, caused by negligence of the Tenderer or otherwise shall not confer any additional rights of withdrawal upon the Tenderer.

1.8 OMISSIONS/DISCREPANCIES

Should a Tenderer find discrepancies in, or omissions from the drawings, specifications or other Tender documents, or should he be in doubt as to their meaning, he should notify the Contract Administrator who may send a written instruction to all Tenderers. Verbal answers are only binding when confirmed by written addenda.

Should the Tenderer not agree that the materials and methods specified, or designated on the drawings, will provide an installation to meet the requirements of the project, he shall notify the Contract Administrator in writing, stating his reason for objection and may submit a suggested alternative. In such an event, the Contract Administrator may choose to issue an addendum.

1.9 ERRORS AND OMISSIONS ON TENDER FORM

Whenever in a Tender the amount tendered for an item does not agree with the extension of the estimated quantity and the tendered unit price, the unit price shall govern and the amount of the Total Tender Price shall be corrected accordingly.

If a Tenderer has omitted to enter a price for an item of work set out in the Tender Form, he shall, unless he has specifically stated otherwise in his Tender, be deemed to have allowed elsewhere in the Tender Form for the cost of performing the said item of work and, unless otherwise agreed to by the Owner, no increase shall be made in the total Tender price on account of such omission and the Tenderer shall be deemed to have tendered for the entirety of the scope of work set out in the Tender Form.

1.10 FEE ON PLANS AND SPECIFICATIONS

Contract drawings and other related documents to this Tender are available in hard copy upon request to the City. A fee of $100.00 will be required for each set of drawings and other contract documents that are provided, which shall be non-refundable.

1.11 QUALIFICATION OF TENDERERS

The City may make such investigations as it deems necessary to determine the ability of the Tenderer to perform the work, and the Tenderer shall furnish to the City all such information and data for the purpose as the City may request. The City reserves the right to reject any Tender if the evidence submitted by or investigation of such Tenderer fails to satisfy the City that such Tenderer is properly qualified to carry out the obligations of the Contract and to complete the work as contemplated therein.

1.12 PROOF OF ABILITY

In order to aid the City in determining the ability of each Tenderer to complete the work, the Tenderer shall complete the following Statement sheets which are bound herein.

Statement "A" – Stating the Tenderer's experience in similar work which it has successfully completed.

Statement "B" – Giving a list of the Tenderer's senior supervisory staff with a summary of the experience of each.

Statement "C" – Giving the location and description of the construction plant which the Tenderer proposes to use, the plant it has available or under its control, the plant to be rented and the plant to be purchased.

Statement "D" – Giving the name and address of each proposed sub-contractor used in making up his Tender and shall state the portion of the work allotted to each. Only one sub-contractor shall be named for each part of the work to be sub-contracted.

Statement "E" – Listing the sources of supply for granular "A" and granular "B". No changes in pit locations from those listed are to be made by the Contractor once the Contract Administrator has approved the sources.

Statement "F" – Performance Parts of the Work – **Not Applicable**

The Tenderer may be required to furnish additional statements covering other matters including financial resources and convictions or orders imposed under Health & Safety or Environmental legislation.

1.13 ALTERNATIVES (Statement "G")

When an article is specified by its trade or other name (whether such name is followed by the phrase "or approved equal" or not), the Tenderer shall base its Tender price on the supply of the named article and no other.

The Tenderer may submit with its Tender suggested alternatives to those articles specified by trade or other names. Such submissions shall be made on Statement "G", bound herein, and shall show the name of the article specified, the name and description of the suggested alternative, and the total revision to the Tender Price that would result if the alternative were accepted.

1.14 AGREEMENT TO BOND

Every Tender shall be accompanied by an "Agreement to Bond" in the form included with the Tender Form and shall be executed under its corporate seal by a

Surety Company lawfully doing business in the Province of Ontario from which the Tenderer proposes to obtain the required Bonds prescribed in the Contract.

The Agreement to Bond and Bonds shall be in digital format. Scanned pdf or unverifiable bonds are not acceptable. All instruction details for accessing authentication should be included with the up-loaded bond(s).

1.15 HARMONIZED SALES TAX (HST)

The tendered price shall include the Harmonized Sales Tax and this amount shall be shown separately on the Tender Form and on invoices submitted by the Contractor.

1.16 TAXES AND DUTIES

The Tenderer shall include sales tax in accordance with current sales tax legislation taking into account any changes that have been made known by the Government and that will occur during the life of the Contract.

If sales taxes are increased or decreased, or other amendments are made in the legislation during the course of the Contract that alter tax amounts carried in the Contract price, an adjustment will be made accordingly to the Total Contract Price.

The Contractor shall keep records and invoices of accounts subject to Federal Harmonized Sales Tax for the purpose of establishing taxes paid and for substantiation in the event of changes to the tax legislation during the course of the Contract.

The Tenderer shall contact the Sales Tax authorities and determine what the applicable taxes are and the procedures for tax exemption and/or refunding and include related administrative costs in the Tender.

1.17 NON-RESIDENT CONTRACTOR

If the Contractor is a non-resident of Ontario, it shall, immediately after it has received the Contract Administrator’s written order to commence work, obtain from the Retail Sales Tax Branch a certificate showing that the Contractor has registered with the Retail Sales Tax Branch and shall submit such certificate to the City at the same time that it furnishes the Performance Bond and the Labour and Material Payment Bond.

The Contractor shall not commence work or order any materials or equipment for the Contract until it has registered with the Retail Sales Tax Branch.

The Contractor shall ensure that all sub-contractors proposed for carrying out any of the work required by the Contract and which are non-residents of Ontario have registered with and have complied with the requirements of the Retail Sales Tax Branch before they commence any such work.

1.18 EXAMINATION OF SITE AND SUB-SURFACE CONDITIONS

Each Tenderer should visit the site of the work before submitting its Tender and must satisfy itself by personal examination as to the local conditions to be encountered during the construction and conduct of the work. It shall make its own estimate of the surface facilities, sub-surface conditions and difficulties to be encountered. It is not to claim at any time after submission of its Tender that there was any misunderstanding of the terms and conditions of the Contract relating to site conditions.

Test borings have been made at the site, and the Test Logs can be found at the back of the contract documents.

The test borings were made to determine the character of the subsoil for design purposes. The Owner warrants only that the information contained in the borehole logs in the geotechnical report is accurate and may be relied upon. The Owner does not warrant any extrapolation or any interpretation of the borehole logs. Tenderer waives any liability of the Owner arising from such report(s) other than the information contained in the borehole logs. The Tenderer, during the period of tender, is responsible for any extrapolation or any interpretation and for any opinions or any conclusions he may reach from an examination of the logs and which he/she may have used in the preparing of the tender. The borehole logs are not part of the tender documents and are for information only.

The Tenderer, during the period of tender, shall make such additional examination of the soil and subsurface conditions as it may deem necessary to satisfy itself as to the conditions that may be encountered during construction.

A site visit can be arranged at the request of the contractor should they desire.

1.19 QUESTIONS DURING TENDER PERIOD

No oral interpretations shall be made to any Tenderers as to the meaning of any of the contract documents or to modify any of the provisions of the contract documents. All inquiries shall be in writing and directed to:

Stephanie Phillips, P.Eng
Stantec Consulting Ltd.
stephanie.phillips@stantec.com

All questions must be received by 3:00 pm local time **Friday, February 13, 2026.**

The last addenda will be issued no later than **Wednesday, February 18, 2026.**

1.20 AWARD OF CONTRACT

The Award of the Contract is subject to the receipt of the following approval:

Portions of the work as identified in the Tender Form may be deleted to meet budget constraints, government approvals or other reasons that prevent the Owner from proceeding with the full scope of work in the Tender.

The Lowest Price Tender will be identified by the Owner based on the lowest Total Tender Price determined before the deletions have been deducted.

The lowest or any tender need not necessarily be accepted.

The contract award date is **Wednesday, March 4, 2026.** Execution of the contract is contingent upon approval by City Council.

1.21 ACCESSIBILITY FOR ONTARIANS WITH DISABILITY ACT, Reg. 429/07 (From Successful Contractor Only) (if applicable)

Prior to the commencement of work under this contract, the Contractor shall also furnish evidence of compliance with requirements of the Accessibility for Customer Service Regulation 429/07, Section 6; Training for Staff. The City may, at its discretion, provide such training if the contractor is required to meet the requirements of Regulation 429/07 on and after January 1, 2012.

1.24 ADDENDA

Any and all changes to the Contract Documents will be issued in the form of addendum. All addenda will be posted on the City's Bids and Tenders website at:

https://www.dryden.ca/your-government/bids-and-tenders/

In the event that an addendum is issued after a Tenderer submits their bid, the Tenderer is responsible for withdrawing the bid submission and resubmitting its bid prior to the closing time. It is the responsibility of the Tenderer to have received all addenda that are issued.

SECTION 00300 - TENDER FORM

1. TENDER FOR THE CONSTRUCTION OF

CONTRACT NO: T-2026-1
SOUTH VAN HORNE HOUSING ENABLING PROJECT

1.1 SUBMISSION

The following Tender is hereby submitted to:

The Corporation of the City of Dryden
30 Van Horne Avenue
Dryden, ON P8N 2A7

Hereinafter called the "Owner"

On behalf of:

_____

Contractor

_____

Address

hereinafter called the "Tenderer"

1.1.1 (We), the undersigned, having fully examined the locality and Place of the Work, having fully investigated the conditions of the Work, having read and understood the Contract Documents (comprised of the tendering information, supplementary general conditions, general conditions, specifications and drawings, including all supplements, addenda and revisions to same to the date of this tender) and having secured all of the information necessary to enable the submission of this tender, hereby agree and offer to perform the totality of the Work described in the Contract Documents, in accordance with the Contract Documents, for the total Tender Price (including H.S.T.) of:

_____ ($_____)

1.2 QUANTITIES

For the unit prices marked lump sum, the Tender Item Price is lump sum and is compiled from the Schedule of Prices included hereinafter. The Contractor is responsible for estimating quantities for the work from the tender drawings and documents and providing a fixed fee lump sum for the item work. The Lump Sum Price for the appropriate items as detailed hereinafter shall be full compensation for all labour, equipment and materials required to do the work.

For the unit prices marked unit price, the Tender Item Price is compiled from the Schedule of Prices included hereinafter. The item quantities in the schedule so marked being approximate, we agree that the final valuation will be made on the basis of actual quantities measured during and on completion of the Work at the unit prices in the schedule.

1.3 ADDITIONS AND DEDUCTIONS

1.3.1 The Tenderer agrees that, if this tender is accepted by the Owner:

(i) it will carry out any additional or extra work (including the supplying of any additional Products pertaining thereto) or will delete any work as may be required by the Contract Administrator in accordance with the Contract; and,

(ii) the carrying out of any work referred to in paragraph (i) above or the issuance by the Contract Administrator of a Contract Change Order relating to such work or the acceptance by the Tenderer of such Contract Change Order shall not, except as expressly stated in such Contract Change Order, waive, affect or vary any of the terms of the Contract or of an Contract Change Order previously issued by the Contract Administrator or any of the rights of the Owner or of the Contract Administrator under the Contract.

1.3.2 The Tenderer agrees that, if this tender is accepted by the Owner the prices applicable to work referred to in paragraph 1.4.1 above shall be determined as follows:

(i) The Schedule of Tender Prices shall apply where applicable;

(ii) If the above Schedule is inapplicable the prices shall be determined in accordance with the General Conditions as amended by the Supplementary General Conditions.

1.4 ADDENDA

We agree that we have received Addenda _____ to _____ inclusive, and the tender price includes for the provisions set out in such Addenda.

1.5 CONTRACT TIME

(i) We agree to commence the Work as specified, to proceed continuously to completion and to complete the Work by **October 30, 2026.**

(i) The Tenderer agrees that if he fails to tender a Contract Time in the space or spaces provided therefor in the Tender Form or in any addendum to the tender package, he will, if requested to do so by the Owner, enter into a Contract with the Owner based upon a Contract Time to be stipulated by the Contract Administrator and which, in the opinion of the Contract Administrator, is fair and reasonable.

1.6 DELETIONS

We agree that any or all of the Provisional Tender Items may be deleted without affecting any other Tender Item prices.

1.7 SCHEDULE OF TENDER PRICES

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
Van Horne Housing Enabling Project					
1.0	**Aboveground**				
1.01	Asphalt Removal	m^2	11,750		
1.02	Clearing & Grubbing	LS	1		
1.03	Earth Excavation and Disposal	m^3	7,462		
1.04	Removal of Storm Pipes	m	255		
1.05	Removal of Storm Manholes and Catchbasins	ea	10		
1.06	Removal of Paving Stone Sidewalk	m^2	472		
1.07	Removal of Concrete Sidewalk	m^2	193		
1.08	Removal of Concrete Curb & Gutter	m	850		
1.09	150mm Granular A Base (Supply, Place and Compact)	t	6,300		
1.10	500mm Granular B Subbase (Supply, Place and Compact)	t	20,120		
1.11	Granular B Roadway Fill (Supply, Place and Compact)	t	4,400		
1.12	40 mm HL4 Asphalt Surface	m^2	15,900		
1.13	40 mm HL4 Asphalt Binder	m^2	15,900		
1.14	Granular A Driveway Reinstatement	m^2	22		
1.15	Crushed Rock Driveway Reinstatement	m^2	32		
1.16	Concrete Driveway Reinstatement	m^2	58		
1.17	50 mm HL4 Asphalt Driveway Reinstatement	m^2	96		
1.18	Concrete Driveway Removal	m^2	19		
1.19	Asphalt Driveway Removal	m^2	96		
1.20	Paving Stone Driveway Removal	m^2	39		
1.21	Class II Non-Woven Geotextile	m^2	13,070		
1.22	New Precast Concrete CB 600x600 (OPSD 705.010) c/w Curb Inlet Grate (OPSD 400.090)	ea	13		

1.23	New Precast Concrete Twin Inlet CB 600x1450 (OPSD 705.020) c/w Curb Inlet Grates (OPSD 400.090)	ea	3		
1.24	New Precast Concrete CB 600x600 (OPSD 705.010) c/w Flat Grate (OPSD 400.020)	ea	4		
1.25	New Precast Concrete Double Catchbasin Manhole (STM) 1800 mm (OPSD 701.012) c/w Curb Inlet Grate (OPSD 400.090)	ea	1		
1.26	New Precast Concrete Catchbasin Manhole1500 mm (OPSD 701.011) c/w Flat Grate (OPSD 400.020)	ea	5		
1.27	New Precast Concrete Manhole (OPSD 701.011) 1500 mm c/w Standard Cover	ea	4		
1.28	Reset Existing Catchbasin and Manhole Frame/Grate and Cover	ea	4		
1.29	900 mm FlowGuard Control Device	ea	1		
1.30	250 mm PVC Storm Pipe (c/w all fittings, excavation and restoration to the underside of Granular B)	m	80		
1.31	300 mm PVC Storm Pipe (c/w all fittings, excavation and restoration to the underside of Granular B)	m	109		
1.32	375 mm PVC Storm Pipe (c/w all fittings, excavation and restoration to the underside of Granular B)	m	82		
1.33	450 mm HDPE Storm Pipe (c/w all fittings, excavation and restoration to the underside of Granular B)	m	283		
1.34	525 mm HDPE Storm Pipe (c/w all fittings, excavation and restoration to the underside of Granular B)	m	46		
1.35	600 mm HDPE Storm Pipe (c/w all fittings, excavation and restoration to the underside of Granular B)	m	100		
1.36	675 mm HDPE Storm Pipe (c/w all fittings, excavation and restoration to the underside of Granular B)	m	98		
1.37	900 mm HDPE Boss 2000 Culvert (c/w all fittings, excavation and restoration to the underside of Granular B)	m	13		
1.38	525 mm HDPE Boss 2000 Culvert (c/w all fittings, excavation and restoration to the underside of Granular B)	m	24		

1.39	New 1.5 m Concrete Sidewalk (c/w 300mm Granular A)	m^2	1,320		
1.40	New Concrete Barrier Curb & Gutter (OPSD 600.040, c/w 300mm Granular A)	m	2,005		
1.41	New Concrete Mountable Curb & Gutter (OPSD 600.100, c/w 300mm Granular A)	m	72		
1.42	Pipe Subdrain, 150mm (OPSD 216.021)	m	2,250		
1.43	Tactile Plates (OPSD 310.039)	ea	7		
1.44	Pavement Markings - 10 cm yellow (CL & Hatching)	m	930		
1.45	Pavement Markings - 10 cm solid Yellow	m	928		
1.46	Pavement Markings - 10 cm solid White	m	1,805		
1.47	Pavement Markings - 10 cm dashed (1-1-1) White	m	102		
1.48	Pavement Markings - 300mm Durable Stop Block	m	39		
1.49	Reserved Bicyle Markings	ea	13		
1.50	New Signs	ea	22		
1.51	Sign Removal	ea	4		
1.52	Signs Relocation	ea	6		
1.53	R10 Rip-Rap c/w Class I Non-Woven Geotextile	m^2	845		
1.54	Erosion and Sediment Control	LS	1		
1.55	100mm Topsoil and Seed	m^2	5,900		
1.56	CCTV Inspection of Storm Sewer Mainlines	m	798		
				SUB-TOTAL ABOVEGROUND	
2.0	**Underground**				
2.01	Rock Excavation	m^3	870		
2.02	Pipe Removal (Sanitary)	m	166		
2.03	Concrete Manhole Removal (Sanitary)	ea	5		
2.04	New Precast Concrete Sanitary Manhole (OPSD 701.011)	ea	11		

2.05	150 mm HDPE Sanitary Forcemain (c/w all fittings, connections, excavation and restoration to the underside of Granular B)	m	659		
2.06	200 mm PVC Sanitary Pipe (c/w all fittings and connections)	m	38		
2.07	250 mm PVC Sanitary Pipe (c/w all fittings and connections)	m	569		
2.08	Remove and replace existing Residential Sanitary Services to Property line	m	70		
2.09	Reset Existing Sanitary Manhole Frame and Grate	ea	3		
2.10	Watermain Pipe Removal	m	424		
2.11	Valve Removal	ea	8		
2.12	Hydrant Assembly Removal (incl. valve)	ea	3		
2.13	150 mm PVC Watermain (c/w all bends, tees, chlorination points, connections, etc.)	m	120		
2.14	200 mm PVC Watermain (c/w all bends, tees, chlorination points, connections, etc.)	m	420		
2.15	300 mm PVC Watermain (c/w all bends, tees, chlorination points, connections, etc.)	m	664		
2.16	Remove and replace existing Residential Water Services to Property line	m	70		
2.17	New Hydrant Assembly (c/w 150mm lead, gate valve and all fittings) OPSD 1105.010	ea	8		
2.18	Auto Flusher Assembly (c/w 25mm lead, outlet, curb stop, and all fittings)	ea	2		
2.19	150 mm Gate Valve	ea	3		
2.20	200 mm Gate Valve	ea	4		
2.21	300 mm Gate Valve	ea	7		
2.22	Watermain Lowering per COTB W-115	ea	2		
2.23	Temporary Potable Water Supply	LS	1		
2.24	CCTV Inspection of Sanitary Sewer Mainlines	m	607		
2.25	Crushed Stone for Pipe Trench	m3	25		

2.26	Excavator Rental Including Operator	Hrs	10		
2.27	ALLOWANCE - Support Existing Poles During Construction	LS	1		
2.28	ALLOWANCE - Excavation for Utility Relocation	LS	1		
	Wastewater Lift Station				
2.29	Metal Fabrications (Access Hatches, Hand Hold, Ladder, etc.)	LS	1		
2.30	Substructure	LS	1		
2.31	Process Mechanical	LS	1		
2.32	Electrical	LS	1		
2.33	Accessories	LS	1		
				SUB-TOTAL UNDERGROUND	
SUMMARY					
TOTAL (EXCLUDING HST)					
13% HST					
TOTAL COSTS					

*Enter this amount in Clause 1.1.1

Company HST Registration Number _____

Schedule of Tender Prices to be submitted in excel format along with the Tender submission.

1.8 DECLARATIONS OF TENDERER

(i) The Tenderer declares that no person, firm or corporation other than the Tenderer has any interest in this tender or in the proposed Contract for which this tender is made.
(ii) The Tenderer declares that this tender is made without any connection, comparison of figures or arrangement with, or knowledge of, any other corporation, firm or person making a tender for the same Work and is in all respects fair and without collusion or fraud.
(iii) The Tenderer declares that any omissions in Tendering Statements A to G will be submitted within two (2) working days after the opening of tenders.

1.9 CONDITIONS OF TENDER

This tender is irrevocable from the official closing time and is unconditionally open for acceptance for 60 days after the official closing time, whether any other tender has been previously accepted or not.

1.10 DISCLAIMER

The Tenderer agrees and acknowledges there is no representation, warranty, collateral agreement or condition, whether direct or collateral, or expressed or implied, which induced the Tenderer to submit this tender, or on which reliance is placed by the Tenderer, or which affects this tender.

1.11 SIGNATURES

Offered by the Tenderer _____ this

_____ day of _____ 2026.

_____ _____
Signature of Tenderer, Title Signature of Witness

_____ _____
Signature of Tenderer, Title Signature of Witness

NOTE: In the case of a tender submitted by a Corporation, the signatory or signatories warrant as follows:

"I/We have authority to bind the Corporation."

If the tender is submitted by an individual or partnership, it is deemed to be given under seal.

SECTION 00310 - AGREEMENT

City of Dryden
Contract No. T-2026-1

SOUTH VAN HORNE
HOUSING ENABLING PROJECT

A G R E E M E N T

This Agreement made in triplicate this _____ day of _____, 2026, between

_____ hereinafter called "The Contractor"

AND

_____ hereinafter called "The Owner"

WITNESSETH that The Contractor agrees with The Owner to perform all the work in accordance with the Contract Documents referred to in the tender of The Contractor dated the ____ day of _____ (which shall be deemed to form part of this Contract) to the satisfaction of the Engineer for the total contract price of $_____ which Contract Documents are attached hereto and which are hereby expressly made part of this Contract.

The Owner hereby agrees with The Contractor that, in consideration of the work being performed by The Contractor as specified, The Owner shall pay The Contractor for said work in accordance with the provisions set out in the attached Contract Documents.

Time shall be deemed the essence of this Contract.

IN WITNESSD WHEREOF the parties hereto have executed this Agreement under their respective corporate seals and by the hands of their proper officers thereunto duly authorized.

SIGNED, SEALED AND DELIVERED
In the presence of:

OWNER

_____
Name

_____
Signed

_____
Name and Title

_____
Witness

_____
Signed

_____
Name and Title

_____
Name and Title

CONTRACTOR

_____
Name

_____
Signed

_____
Name and Title

_____ _____
Witness Signed

_____ _____
Name and Title Name and Title

Note: In the case of a tender submitted by a Corporation, the signatory or signatories warrant as follows:

"I/We have the authority to bind the Corporation"

If the tender is submitted by an individual or partnership, it is deemed to be given under seal.

SECTION 00610 - AGREEMENT TO BOND

Date: _____, 2026

_____
[Name of Surety Company]

_____
[Address]

_____

City of Dryden
30 Van Horne Avenue
Dryden, ON P8N 2A7

To Whom It May Concern:

CONTRACT NO. _____

Should the Corporation of Dryden [hereinafter referred to as the "Owner"] accept the Tender of and execute an Agreement with _____ [hereinafter referred to as the "Tenderer"], we, the undersigned Surety Company, do hereby consent and agree to become bound to the Owner as Surety for the Tenderer in any of the following Bonds, on the standard format of the Canadian Construction Association.

1. Performance Bond for an amount equal to 100% of the Total Tender Price.

2. Labour and Material Payment Bond for an amount equal to 50% of the Total Tender Price.

We, the undersigned Surety Company, agree to furnish the Owner with the said Bonds within 7 days after written notification that the Owner has requested the said Bond or Bonds. We hereby further declare that our Company is legally entitled to do business in the Province of Ontario.

Yours truly,

_____
[Name of Surety Company]

_____
[Address]

[Seal]

NOTE: This Agreement must be executed on behalf of the Surety Company by its authorized Officers under the Company's corporate seal.

SECTION 00620 - UNDERTAKING TO COMPLY WITH THE CITY OF DRYDEN'S POLICY ON CONTRACTOR SAFETY

Name of Contractor: _____ (the "Constructor")

Description of Contract: _____ (the "Contract")

Name of Authorized Representative
of the Contractor _____

1. I/We hereby undertake:

   (a) To comply with all health and safety and environmental legislation in the performance of this contract;

   (b) To maintain a safe and healthy work environment during the performance of this contract;

   (c) To comply with the City of Dryden's Contractor Safety Policy as set out in the Supplementary General Conditions.

2. I/We hereby agree:

   (a) That compliance with all health and safety and environmental legislation is a condition of the contract and that non-compliance with same may, in the Corporation of the City of Dryden (hereinafter the Owner) discretion, lead to the termination of this Contract;

   (b) To permit the Owner to audit my/our health and safety and environmental records during the term of the contract and upon its conclusion and to co-operate fully with any such audit(s).

   (c) To permit the Owner to monitor the adherence of the pre-construction checklist and provide forthwith to the Owner any orders, directives or narratives received by a regulatory authority related to any work being performed to fulfill the requirements of the contract.

3. (a) I/We understand that contractor safety deficiencies will be addressed by the Owner in the following progressive steps:

      (i) The problem will be identified to the Contractor (site supervisor).

      (ii) The Contractor's head office will be contacted about the problem, orally and later in writing.

(iii) If required by law to immediately report the problem to a provincial and/or federal Ministry, the Owner will immediately do so.

(iv) If not required by law to immediately report the problem, and the problem remains unresolved, the Owner may report the problem to the appropriate Ministry(ies).

(v) The Contract may, in the Owner's discretion, be suspended or terminated and/or payment withheld by the Owner.

(b) I/We acknowledge and agree that, depending upon the nature and/or seriousness of the deficiency, the Owner reserves the right to bypass any or all of the steps described in subsection 3(a).

4. I/We hereby acknowledge:

(a) receipt of a copy of the Corporation's Contractor Safety Policy and that I/we understand and undertake to adhere to the terms of this Policy and to co-operate with the Corporation in its efforts to ensure compliance thereunder.

I/We have the authority to bind the Contractor.

_____(Date)

SIGNED, SEALED AND DELIVERED
in the presence of:

(Name of Contractor)

Per:

_____ _____
(Print name of Signing Party under each signature)

_____ _____
(Print name)

TENDERING STATEMENTS

A Tenderer's Experience in Similar Work

B Tenderer's Senior Supervisory Staff

C Tenderer's Construction Plant

D Sub-Contractors and Suppliers

E Source of Granular Materials, Concrete and Asphalt

F Performance Parts of the Work

G Schedule of Equivalents

STATEMENT "A" – TENDERER'S EXPERIENCE IN SIMILAR WORK

Year	Description of Contract	Owner's Name	Value

STATEMENT "B" – TENDERER'S SENIOR SUPERVISORY STAFF

Name	Appointment	Qualification and Experience

STATEMENT "C" – TENDERER'S CONSTRUCTION PLANT

STATEMENT "D" – SUB-CONTRACTORS AND SUPPLIERS

The Tenderer shall quote the name and address of each proposed subcontractor or supplier. After the Tender has been accepted by the Owner, the Contractor shall not be allowed to substitute other subcontractors or suppliers in place of those named below without written approval of the Engineer.

NOTE: Indicate "N/A" or "None" if you intend on performing all aspects of this Work.

Sub-Trade Section or Equipment	**Name and Address of Sub-Contractor or Supplier**
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Name of Concrete Flatwork: _____

ACI Certified Person On-site: _____

(new mandatory qualification)

STATEMENT "E" – SOURCES OF GRANULAR MATERIALS, CONCRETE AND ASPHALT

Material	**Supplier**	**Supplier's Pit Location**
HL4	_____	_____
Granular "A"	_____	_____
Granular "B"	_____	_____
R10 RIP-RAP	_____	_____
Concrete	_____	_____
Topsoil	_____	_____

STATEMENT "F" – PERFORMANCE PARTS OF THE WORK (NOT APPLICABLE)

1. Description of Performance Parts

   _____

   _____

   _____

   _____

   _____

   _____

2. Proposed Design

   Enclose written description and drawings with Tender.

3. Professional Engineer/Architect or other Expert responsible for the Design and Inspection of the Work

   Name: _____

   Address: _____

   Telephone: _____ Fax: _____ E-Mail: _____

STATEMENT "G" – SCHEDULE OF EQUIVALENTS

Specified Article	Name of Submitted Equivalent	Catalogue No. etc. of Submitted Equivalent	Proposed Price Revision

ONTARIO PROVINCIAL STANDARDS
GENERAL CONDITIONS OF CONTRACT
SUPPLEMENTARY GENERAL CONDITIONS

1. GENERAL CONDITIONS OF THE CONTRACT

(a) For the purpose of this Contract, the Ontario Provincial Standards, General Conditions of Contract (November 2024 issue) shall be amended as set out herein.

(b) Where any article, paragraph or subparagraph in the Ontario Provincial Standards, General Conditions of Contract (November 2024 issue) is supplemented by one of the following paragraphs, the provisions of such article, paragraph, or subparagraph shall remain in effect and the supplemental provisions shall be considered as added thereto.

(c) Where any article, paragraph or subparagraph in the Ontario Provincial Standards, General Conditions of Contract (November 2024 issue) is amended, voided or superseded by any of the following paragraphs, the provisions of such article, paragraph or subparagraph not so amended, voided or superseded shall remain in effect.

SECTION GC 1.0 - INTERPRETATION

1. GC 1.04 DEFINITIONS

The following definitions are amended:

(a) **Contract Documents** is amended to read: **Contract Documents** means the executed Agreement between the Owner and the Contractor, Tender, General Conditions of Contract, Supplemental General Conditions of Contract, Standard Specifications, Special Provisions, Contract Drawings, Plans, Addenda incorporated in a Contract Document before the execution of the Agreement, such other documents as may be listed in the Agreement, and subsequent amendments to the Contract Documents made pursuant to the provisions of the Agreement.

(b) **Contractor** is amended to read: **Contractor** means the Person undertaking the Work as identified in the Agreement. The term **Contractor** means the Contractor or the Contractor's authorized representative, as designated to the Owner, in writing.

(c) **Controlling Operation** is amended to read: **Controlling Operation** means any component of the Work, as determined by the Contract Administrator, that, if delayed, will delay the completion of the Work.

(d) **Owner** is amended to read: **Owner** means the party to the Contract for whom the Work is being performed, as identified in the Agreement, and includes, with the same meaning and import, **Authority**, **Corporation** or the Owner's authorized agent or representative, as designated to the Contractor, in writing, but does not include the Contract Administrator.

(e) **Proper Invoice** is amended to read: **Proper Invoice** means an application for payment containing the information that is required for the application for payment to constitute a "proper invoice" under the Construction Act and this Contract, including the following:

(i) all of the information specified to be included in a proper invoice as set out in the Construction Act, namely:

(ii) the Contractor's name and address;

(iii) the date of the application for payment and the period during which the Work was performed;

(iv) the authority under which the Work was performed, including the applicable purchase order number;

(v) a description, including quantity where appropriate, of the Work performed and Materials supplied;

(vi) the amount payable for the Work performed, and the payment terms;

(vii) the name, title, telephone number and mailing address of the person to whom payment is to be sent;

(viii) for each Proper Invoice after the first one, a statutory declaration in a form satisfactory to the Contract
Administrator that all liabilities incurred by the Contractor and the Contractor's Subcontractors in carrying out the Contract have been discharged expect for statutory holdbacks properly retained;

(ix) the total amount of expenditures to date and the total estimated expenditures to be made for the remaining balance of the Work, each broken out in itemized lists per category of expenditure;

(x) satisfactory evidence of good standing under the WSIA, as evidenced by a Certificate of Clearance issued by the Workplace Safety and Insurance Board prior to the release of any monthly progress payment;

(xi) any certificates, inspection reports, or data resulting from commissioning and testing required under the Contract Documents confirming the satisfactory completion of such commissioning and testing for completed portions of the Work; and

(xii) any additional information that the Owner or the Consultant may reasonably require."

(g) **Subcontractor** is amended to read: **Subcontractor** means a Person undertaking the execution of a part of the Work, or supplying Material for the Work, by virtue of an agreement with the Contractor, and which has been approved by the Owner.

(h) **Substantial Performance** is amended to read: **Substantial Performance** means:

(i) the Work or a substantial part thereof has passed inspection and testing and is ready for use or is being used for the intended purposes; and

(ii) the Work is capable of completion or, where there is a known defect, correction, at a cost of not more than,

(1) 3 per cent of the first $1,000,000 of the Contract price,

(2) 2 per cent of the next $1,000,000 of the Contract price, and

(3) 1 per cent of the balance of the Contract price.

Add the following definitions:

(i) **Applicable Laws** means any federal, provincial, territorial, regional, municipal or local statutes, laws, by-laws, rules, regulations, codes (including design and building codes), ordinances, permits, decrees, writs, injunctions, orders or the like, of any Governmental Authority, applicable to the Contractor, or to the performance of the Work.

(j) **AODA** means the Accessibility for Ontarians with Disabilities Act (Ontario).

(k) **Commission** means the procedure which includes checking, testing, adjusting and measuring performed by the Contractor to demonstrate and verify the installation, operation and performance of all components and the entire system.

(l) **Confidential Information** means all information which the Contractor receives, either directly or indirectly, from the Owner or from any other Project participant with respect to the Project and any reports, recommendations and/or conclusions which the Contractor may make for the Owner and shall include, without limitation, all information pertaining to the Owner's business, operations, equipment, products or technology. **Confidential Information** shall not include:

(i) information which at the time of disclosure is already known to the Contractor other than as a result of a disclosure by any person in breach of any obligation or covenant to maintain such information confidential;

(ii) information which at the time of disclosure is or thereafter becomes generally available to the public through no act or failure to act on the part of the Contractor; and

(iii) information which is disclosed to the Contractor by a third party without a covenant of confidentiality to the Owner.

(m) **Contractor Performance Report** has the meaning given in GC 3.17.03.

(n) **Dispute 2** has the meaning given in GC 3.17.06.

(o) **Disqualification List** has the meaning given in GC 3.17.09.

(p) **Environment** means the ambient air, all layers of the atmosphere, all water including surface water and underground water, all land, all living organisms and the interacting natural systems that include components of air, water, land, living organisms and organic and inorganic matter, and includes indoor spaces.

(q) **Environmental Laws** means all Applicable Laws relating to the Environment and the protection of the Environment, the regulation of chemical substances or products, health and safety including occupational health and safety, and the transportation of dangerous goods.

(r) **Force Majeure Event** means an event beyond the control of a Party, including without limitation, (i) an earthquake, tornado, or other act of God; (ii) an explosion, fire, insurrection, war, sabotage, terrorist act or vandalism or a local, regional or national state of emergency; (iii) Abnormal Weather; and, (iv) a strike, lockout or other labour dispute beyond the Contractor's control.

(s) **Furnish** means the procurement or fabrication of materials, equipment, or components, or the performance of services to the extent indicated, including all costs in connection therewith to complete the Work. Where used with respect to materials, equipment or components, the term shall include delivery to the Working Area but is not intended to include the installation of the item, either temporary or final.

(t) **Governmental Authority** means any federal, provincial, local, municipal, regional, territorial, aboriginal, or other government, governmental or public department, branch, ministry, or court, domestic or foreign, including any district, agency, commission, board, arbitration panel or authority and any subdivision of any of them exercising or entitled to exercise any administrative, executive, judicial, ministerial, prerogative, legislative, regulatory, or taxing authority or power of any nature.

(u) **Hazardous Substance** means any substance, waste, liquid, gaseous or solid matter, fuel, micro-organism, sound, vibration, ray, heat, odour, radiation, energy vector, plasma, organic or inorganic matter which is or is deemed to be, alone or in any combination, hazardous, hazardous waste, solid or liquid waste, toxic, a pollutant, a deleterious substance, a contaminant or a source of pollution or contamination, regulated by any Environmental Laws.

(v) **Install** means the placement of materials, equipment or components, including the receiving, unloading, transporting, storage, uncrating and installing, and the performance of such testing and finishing work as is compatible with the degree of installation specified, including all costs in connection therewith to complete the Work.

(w) **Maintenance Security Holdback** has the meaning given in GC 8.02.10.01.

(x) **Manager Supply Management** means the person designated by the Owner to oversee the Contractor Performance Evaluation procedure set out in GC 3.17.

(y) **Ministry** means the Ministry of Transportation of Ontario.

(z) **Notice to Proceed** has the meaning given in GC 7.01.02.

(aa) **OHSA** means the Occupational Health and Safety Act (Ontario).

(bb) **Panel** has the meaning given in GC 3.17.06.

(cc) **Person** will be broadly interpreted and includes:

(i) a natural person, whether acting in his or her own capacity, or in his or her capacity as executor, administrator, estate trustee, trustee or personal or legal representative, and the heirs, executors, administrators, estate trustees, trustees or other personal or legal representatives of a natural person;

(ii) a corporation or a company of any kind, a partnership of any kind, a sole proprietorship, a trust, a joint venture, an association, an unincorporated association, an unincorporated syndicate, an unincorporated organization or any other association, organization or entity of any kind; and (iii) a Governmental Authority.

(dd) **Project Specifications** means Ontario Provincial Standard Specifications and Special Provisions. The OPS Specifications in effect when the call for tenders for this Contract was advertised shall apply for the duration of the Contract.

(ee) **Provide** means to Furnish, Install, Commission, complete and put in place, including all accessories, finishes, tests, and services as required to render the item so specified complete and ready for use, including all costs in connection therewith to complete the Work and supply all labour, materials, equipment, handling and cartage required to render the item so specified complete and the word "**Provided**" has a corresponding meaning.

(ff) **Release** means to release, spill, leak, pump, pour, emit, empty, discharge, deposit, inject, leach, dispose, dump or permit to escape.

(gg) **Schedule of Prices** means the schedule of items and unit prices submitted by the Contractor in the Tender Form - "Schedule of Items and Unit Prices".

(hh) **WSIA** means Workplace Safety and Insurance Act (Ontario).

Add new GC 1.04.02 as follows:

"GC 1.04.02 Any reference in this Contract to any statute includes all regulations and subordinate legislation made under or in connection with that statute at any time, and is to be construed as a reference to that statute as amended, modified, restated, supplemented, extended, reenacted, replaced or superseded at any time."

SECTION GC 2.0 – CONTRACT DOCUMENTS

2. GC 2.01 RELIANCE ON CONTRACT DOCUMENTS

(a) Paragraph .01(a) is replaced by the following:

"(a) The Contractor shall assume full responsibility for obtaining the exact locations of all Utilities. The Contract Administrator does not warrant the correctness or completeness of the Plans with respect to the Utilities and services whether underground or on the surface. The Contractor shall have no claim for additional compensation, if, in uncovering and carrying out the Work, it should find that the actual location of the Utilities does not correspond with the locations shown on the Plans."

3. GC 2.02 ORDER OF PRECEDENCE

(a) Paragraph GC 2.02.02 (b) is amended by adding the words "of the same date" to the end of this paragraph.

SECTION GC 3.0 – ADMINISTRATION OF THE CONTRACT

4. GC 3.01 CONTRACT ADMINISTRATOR'S AUTHORITY

(a) Paragraph GC 3.01 is amended by the addition of the following paragraphs:

"(a) The Contract Administrator will not be responsible for and will not have control, charge, or supervision of construction means, methods, techniques, sequences, or procedures, or for safety precautions and programs required in connection with the Work in accordance with the Applicable Laws or general construction practice. The Contract Administrator will not be responsible for the Contractor's failure to carry out the Work in accordance with the Contract Documents. The Contract Administrator will not have control over, charge of, or be responsible for the acts or omissions of the Contractor, Subcontractors, suppliers or their agents, employees and any other Person performing portions of the Work.

(b) Whenever the Contract Administrator considers it necessary or advisable, the Contract Administrator will have authority to require inspections or testing of the Work, whether or not such Work is Provided. However, neither the authority of the Contract Administrator to act, nor any decision either to exercise or not to exercise such authority, shall give rise to any duty or responsibility of the Contract Administrator to the Contractor, Subcontractors, suppliers or their agents, employees or other Person performing any of the Work."

(b) Paragraph GC 3.01.05 is replaced by the following:

".05 The Contract Administrator shall, with reasonable promptness, review and take appropriate action upon the Contractor's submissions such as shop drawings, product data, and samples in accordance with the Contract Documents."

(c) Paragraph GC 3.01.16 is amended by replacing the words "applicable laws or bylaws" with the words "Applicable Laws".

(d) Paragraph GC 3.01 is amended by the addition of the following paragraph:

".18 All certificates issued by the Contract Administrator shall be to the best of the Contract Administrator's knowledge, information and belief. By issuing any certificate, the Contract Administrator does not guarantee the Work is correct or completed."

5. GC 3.02 WORKING DRAWINGS

(a) Paragraph GC 3.02.06 is revised by deleting the words "Permission to construct granted".

(b) Paragraph GC 3.02.07 is revised by adding the following words to the end of the paragraph: "and make such set available to the Owner and the Contract Administrator at all times".

6. GC 3.06 EXTENSION OF CONTRACT TIME

(a) Paragraph GC 3.06.01 is amended by replacing the words "as soon as" with the words "within 15 Days of the date".

7. GC 3.07 DELAYS

(a) Paragraph GC 3.07.01 is replaced as follows:

".01 If the Contractor is delayed in the performance of the Work by:

(a) war, blockades, and civil commotions, strikes, lockouts, labour disputes, errors in the Contract Documents;

(b) an act or omission of the Owner, Contract Administrator, the Owner's other contractors, or anyone employed or engaged by them directly or indirectly, contrary to the provisions of the Contract Documents; or

(c) a stop work order issued by a Governmental Authority, provided that such order was not issued as the result of an act or omission of the Contractor or anyone employed or engaged by the Contractor directly or indirectly; or

(d) the Contract Administrator giving notice under GC 7.09, Suspension of Work; or

(e) Abnormal Weather; or

(f) archaeological finds in accordance with GC 3.15, Archaeological Finds,

then the Contractor shall not be reimbursed by the Owner for any costs incurred by the Contractor as the result of such delay. Any delay in the performance of the work shall be considered for extension of Contract Time only.

In the case of an application for an extension of Contract Time due to Abnormal Weather, the Contractor shall, with the Contractor's application, submit evidence from Environment Canada in support to such application. Extension of Contract Time may be granted in accordance with Subsection GC 3.06, Extension of Contract Time.

(b) Paragraph GC 3.07.02 is amended by adding, after the words "which are beyond the Contractor's control", the words "but expressly excluding labour disputes, strikes or lock-outs of the employees of the Owner".

(c) Paragraph GC 3.07.03 and 3.07.04 are replaced as follows:

".03 The Contractor shall not have any claims for compensation or damages against the Corporation for any stoppage or delay from any cause whatever, including for delays incurred as a result of a dispute between the Contractor and Owner."

8. GC 3.08 ASSIGNMENT OF CONTRACT

(a) Paragraph GC 3.08.01 is amended by adding the following words to the end of this paragraph: "which consent may be arbitrarily withheld by the Owner".

(b) Paragraph GC 3.08 is amended by the addition of the following paragraph:

".02 No assignment of this Contract in whole or in part shall be valid unless it contains a provision that the funds to be paid to the assignee under the assignment are subject to the prior lien for services rendered or material supplied for the performance of the Work called for in the Contract in favour of a Person rendering such services or supplying such materials."

9. GC 3.09 SUBCONTRACTING BY THE CONTRACTOR

(a) Paragraph GC 3.09 is amended by the addition of the following paragraphs:
".07 The Contractor shall, in the case of its Subcontractors and suppliers, be held responsible for and shall ensure that they obtain all necessary permits, fees, licenses, certifications, inspections and all insurance in connection with the Work as may be required by Applicable Laws relating to the Work and by the Contract Documents.
.08 The Contractor shall submit to the Corporation, for its approval, a list of proposed Subcontractors, showing the value of the Work to be subcontracted to each, prior to such Subcontractor participating in the Work. The total value of the Work subcontracted shall not exceed 50% of the total tender."

10. GC 3.10 CHANGES

(a) Paragraph GC 3.10 of the General Conditions is modified for purposes of this Contract in cases where the Owner requests the Contractor to submit cost quotations in advance for any changes in the Work, Extra Work or Additional Work.

(b) For changes in the Work, Extra Work or Additional Work approved in advance by the Contract Administrator in accordance with cost quotations submitted by the Contractor, payment shall be based on the approved quoted cost and the requirements of paragraph GC 3.13 and paragraph GC 8.02.05 shall not apply.

(c) The Contractor shall not perform any Extra Work, Additional Work, or Change in the Work without a Change Order or a Change Directive directing the Contractor to proceed with a change in the Work. No claim for any change in the Contract price or for any extension or alteration of the Contract Time shall be valid except as shown in a Change Order or Change Directive. For clarity, any work which the Contractor performs which is not shown in a Change Order or Change Directive shall be deemed to be performed as part of the Work and included in the Contract price.

11. GC 3.10.01 CHANGES IN THE WORK

(a) Paragraph GC 3.10.01.01 is amended by replacing the second sentence with the following sentence: "The Contractor shall not be required to proceed, and shall not proceed, with a Change in the Work until in receipt of a Change Order or Change Directive."

(b) Paragraph 3.10.01.03 is replaced by the following:

".03 The valuation of additions to, and deductions from, the Contract shall be made as follows:

(a) The prices in the Schedule of Prices or provisional items shall apply where appropriate as determined by the Contract Administrator. If the Contractor and the Owner cannot agree to a valuation, then they shall agree to use the Owner's tender price averages over the preceding 12 months.

(b) If the prices in paragraph (a) above are not appropriate, valuation will be made by one of the following methods:

(i) Contract Administrator may ask the Contractor for a quotation for the proposed work.

(ii) If the quotation referred to in (i) above is not accepted by the Contract Administrator, the actual cost of the work will be determined on a Time and Material Basis in accordance with the applicable Contract Documents.

(c) Whenever Extra Work is being performed under GC 3.10.01.03(b)(ii), the Contractor shall submit Daily Work Records in writing, to the Contract Administrator, indicating the total chargeable costs incurred, for the Day. Valuation of the Extra Work being so performed will be made by the Contract Administrator on the basis of approved Daily Work Records.

12. GC 3.10.02 EXTRA WORK

(a) Paragraph GC 3.10.02.03 and paragraph GC 3.10.03.03 are amended by inserting the following sentence at the end of these paragraphs: "In presenting its claim to the Owner for a cost of a change in the Work, the Contractor shall include, itemize and separate all direct and indirect costs associated with that change, provided that the Contractor shall not be entitled to payment for insurance costs unless the Owner is requiring insurance in addition to the insurance coverage required by the Owner for the Work or the Extra Work will extend the Contract Time."

13. GC 3.11.05 NOTICES

(a) Paragraph GC3.11 is amended by adding the following as a new paragraph GC3.11.05:

".05 In addition to the addresses, requirements and timelines set out in this paragraph GC3.11, the following applies:

.1 for the purposes of Part I.1 the Construction Act (Prompt Payment) and paragraph GC8.0,

(i) applications for payment and Proper Invoices will be considered given or delivered by the Contractor to the Owner when hard copies are received by the Owner and their receipt can be verified; and

(ii) notices of non-payment will be considered to have been given or delivered by the Owner to the Contractor when they have been sent by the Owner and such sending can be verified; and

.2 for the purposes of Part II.1 of the Construction Act (Adjudication), any notices, communications or delivery of documents to be given under the Construction Act will:

(iii) in the case of the Owner, be given by the Contractor to the Owner in hard copy considered received once their receipt can be verified; and

(iv) in the case of the Contractor, be given by the Owner to the Contractor in accordance with the balance of paragraph GC3.11.

14. GC 3.13.01 CONTINUANCE OF THE WORK

(a) Paragraph GC 3.13.01 is amended by the addition of the following paragraphs:

".02 The Contractor shall give written notification of its intent to submit a claim for Extra Work prior to the commencement of that Work; otherwise claims for Extra Work will not be considered."

"0.3 The Contractor shall submit claims not later than 30 Days after the date the Work is substantially performed identifying the item or items in respect of which the claim arises, stating the grounds upon which the claim is made and submitting the records maintained by the Contractor supporting each claim."

15. GC 3.13.05 MEDIATION

(a) Paragraph GC 3.13.05.02 is amended by adding the following at the end of the sentence: ", and the parties agree that the mediation shall be conducted in accordance with the mediation procedure set out in CCDC 40."

(b) Paragraph GC 3.13.05.03 is amended by deleting the words "prior to proceeding to arbitration".

(c) Paragraph GC 3.13.07.01 is amended by deleting the words "provided that the requirements set out in this paragraph are fulfilled".

16. GC 3.13.07 RIGHTS OF BOTH PARTIES

(a) Delete paragraph GC 3.13.07.02 in its entirety.

17. GC 3.14 ARBITRATION

(a) Paragraph GC 3.14.01.01 is amended by replacing the word "invoke" with the words "propose to the other party to resolve the claim in accordance with" and by adding at the end of the paragraph, the following sentence:

"Neither party is obligated to proceed to resolve the claim by engaging in arbitration; however, upon mutual agreement, the parties may proceed to arbitrate the claim in accordance with the process outlined in this GC 3.14."

18. GC 3.16 ADJUDICATION

(a) Add a new paragraph GC 3.16 as follows:

"**GC 3.16 Adjudication**

01. Notwithstanding anything else in this Contract, in the event of a dispute relating to payment arising prior to the completion of the Work, the parties may adjudicate such dispute in accordance with the Construction Act. If the Contractor issues a notice of adjudication to the Owner, it will include with such notice a description of the reasons for its dispute that includes a reference to the applicable application for payment and Proper Invoice, all notices in writing demanding payment, authority for the claim under the Contract (including copies of any applicable Change Order, Change Directive or written approval of any Change in the Work).

.02 The parties acknowledge and agree that the adjudication of a payment dispute in accordance with the Construction Act will not pause, withdraw, discontinue, or prejudice any arbitration, mediation, or court proceeding that relates to the same

matter and that was commenced prior to the delivery of a notice of adjudication under the Construction Act unless the parties otherwise agree in writing."

19. GC 3.17 CITY OF DRYDEN POLICY ON CONTRACTOR SAFETY

(a) Add a new paragraph GC 3.17 as follows:

"**GC 3.17 CITY OF DRYDEN POLICY ON CONTRACTOR SAFETY**

0.1 ***Policy Statement***:

All contractors or land developers working on municipal projects are required to work in compliance with OHSA. All contractors working on city streets and roads will comply with the Ontario Traffic Manual – Book 7.

Failure to comply will be considered a breach of Contract and may result in work stoppage, Ministry of Labour involvement, or in termination of the Contract.

.02 Contractor safety deficiencies will be addressed by the Owner in the following progressive steps:

(a) The problem will be identified to the Contractor (site supervisor).

(b) The Contractor's head office will be contacted about the problem, orally and later in writing.

(c) If the problem remains unresolved, then the Ministry of Labour will be notified of the violation, and, if necessary, the work will be stopped until the problem is corrected.

(d) The Contract may be terminated by the City."

20. GC 3.18 CITY OF DRYDEN POLICY ON CONTRACTOR PERFORMANCE EVALUATIONS

(a) Add a new paragraph GC 3.18 as follows:

"**GC 3.18 CITY OF DRYDEN POLICY ON CONTRACTOR PERFORMANCE EVALUATIONS**

.01 All Contractors working on a municipal contract are subject to a performance evaluation. Performance evaluations for a multi-year contract, shall be completed on the annual anniversary of such contract, or for a contract for a term of less than one year, upon Substantial Performance or early termination of such contract.

.02 The Contract Administrator shall monitor and evaluate the performance of the Contractor pursuant to the terms of this section, including for clarity, documenting evidence of the Contractor's performance. The Contractor's performance shall be rated on a scale of 0 – 3 (0 – poor, 1 – below standard, 2 – standard, 3 – above standard) under the following categories, as applicable, and/or under any specific categories specified in the Contract:

(a) demonstrated skill and knowledge during the performance of the work and/or services under the Contract;

(b) adherence to Drawings, Plans, Project Specifications and Special Provisions;

(c) public relations;

(d) condition and sufficiency of resources, including, without limitation, labour, skilled labour and equipment;

(e) health and safety procedures and compliance with such procedures;

(f) administration, organization, co-ordination and efficiency of the work and/or services;

(g) environmental compliance;

(h) compliance with corporate by-laws and, as applicable, corporate policies and requirements as set forth in the Contract;

(i) compliance with the requirements of the Contract;

(j) responsiveness to third party claims;

(k) site supervision at the place of the work; and

(l) compliance with Applicable Law.

.03 The overall performance rating shall be determined based upon the performance of the Work under the Contract, quality assurance test(s), letters, and written instructions to the Contractor and any other material reasons deemed relevant by the Contract Administrator. The Contract Administrator will inform the Manager Supply Management, in writing, as to the performance of the Contractor pursuant to the terms of this section and shall submit to the Manager Supply Management a performance report for each Contractor ("**Contractor Performance Report**"). A copy of the completed Contractor Performance Report shall be sent by the Manager Supply Management (or designate) to the Contractor.

.04 If the Contractor disagrees with any portion of the Contractor's Performance Report, the Contractor shall advise the Manager Supply Management of the Contractor's specific objections, in writing, within thirty (30) days from the date the Manager Supply Management (or designate) delivered the Contractor Performance Report to the Contractor.

.05 Once an objection is received from the Contractor, the Manager Supply Management shall, within thirty (30) days from the date of receipt by the Manager Supply Management of the objection, advise the Contractor that the Contractor's Performance Report has been affirmed, and the reasons therefor, or deliver to the Contractor an amended Contractor Performance Report together with the reasons therefor.

.06 If the Contractor disputes the response from the Manager Supply Management, the Contractor may, within thirty (30) days from the date the Manager Supply Management (or designate) delivered the response to the Contractor, deliver a dispute in writing ("**Dispute 2**") to the Manager Supply Management who shall convene a three person panel consisting of two City of

Thunder Bay General Managers (or their acting General Manager(s)) (including the General Manager (or the acting General Manager) from the Department for which the Work was performed by the Contractor) and a Director from a Department other than the Department for which the work or services was performed (the "Panel").

.07 The Panel shall advise the Contractor, in writing, within thirty (30) days of the delivery of the Contractor's Dispute 2 to the Manager of Supply Management, that the Contractor's Performance Report has been affirmed, and the reasons therefor, or deliver to the Contractor an amended Contractor's Performance Report together with the reasons therefor.

.08 The decision of the Panel in determining the dispute is final and there shall be no further appeal rights.

Disqualified Bidders Lists

.09 The Manager Supply Management will maintain a list of Contractors from whom bids will not be accepted by the Owner for a period of two years or such lesser period as is determined by a Contract Administrator (subject to the satisfaction of any conditions imposed on a Contractor as described below) from the date the Contractor was originally delivered a copy of the Contractor's Performance Report by the Manager Supply Management (the "Disqualification List").

.10 The Disqualification List will include the names of Contractors who have, in the context of the Contractor Performance Report, received:

(a) at least four below standard and/or four poor evaluations over a two calendar year period; or
(b) at least one poor evaluation in any calendar year arising as a result of a Contractor's poor performance in respect of one of health and safety, environmental matters, demonstrated skill and/or knowledge in the performance of the Work under the Contract or any non-compliance with any Applicable Law.

.11 At the time a Contractor is notified that it will be disqualified and included on the Disqualification List, a Contract Administrator shall advise the Contractor as to the conditions the Contractor must meet in order to be removed from the Disqualification List. The Contractor shall be entitled after the expiration of two years (or such lesser period as identified above) following the date the Contractor was first added to the Disqualification List, to apply to the same Contract Administrator who advised the Contractor as to the conditions (or if such person is not available, another Contract Administrator) for a determination as to whether the Contractor has satisfied the conditions imposed on the Contractor. If the Contractor disputes the decision of the Contract Administrator, the Contractor may follow the same appeal process, within the same timelines, as detailed in this section such that the Contractor may first appeal to the Manager Supply Management and subsequently to the Panel, whose decision shall be final and binding.

.12 The Disqualification List will also include the names of contractors who are involved in litigation with the Owner relating to past contracts. Contractors whose names are on the Disqualification Lists will not be permitted to submit bids to the Owner. In addition, the Manager Supply Management may refuse to accept Bids from contractors who are affiliated with a contractor on the Disqualification List through direct involvement or effective control by one or more of the directing minds of the other contractor on the Disqualification List."

SECTION GC 4.0 – OWNER'S RESPONSIBILITIES AND RIGHTS

21. GC 4.02 APPROVALS & PERMITS

(a) Paragraph GC 4.02.02 is replaced with the following:

".02 The Contractor shall obtain and pay for all permits, licences and certificates solely required for Project approval."

22. GC 4.04 CONSTRUCTION AFFECTING RAILWAY PROPERTY

(a) Paragraph GC 4.04.01 is amended by the addition of the words "When construction affects railway property," at the beginning of the paragraph.

(b) Add a new paragraph GC 4.04.04 as follows:

.04 For greater certainty, the Work will not include any activity associated with removal, reinstatement or adjustment to railway infrastructure (including rail, ties and ballasts) unless specifically indicated in the Contract. These works will remain at the discretion of the railway company to retain the services of the Contractor if required as a service to the railway company."

23. GC 4.05 DEFAULT BY THE CONTRACTOR

(a) Paragraph GC 4.05.01 is deleted and replaced by the following:

(b) ".01 If the Contractor fails to commence the Work within 14 Days of a formal order to commence Work signed by the Contract Administrator or, upon commencement of the Work, should neglect to prosecute the Work properly or otherwise fails to comply with the requirements of the Contract the Owner may, without prejudice to any other right or remedy the Owner may have, notify the Contractor in writing that the Contractor is in default of the Contractor's contractual obligations and instruct the Contractor to correct the default in the 5 Working Days immediately following the receipt of such notice."

24. GC 4.06 CONTRACTORS RIGHT TO CORRECT A DEFAULT

(a) Paragraph GC 4.06 is amended as follows:

.01 change reference from five "5" to three "3" Working Days.

.02 change reference from five "5" to three "3" Working Days.

.02(a) change reference from five "5" to three "3" Working Days.

(b) Paragraph GC 4.06.01 is amended by inserting the words "in a manner acceptable to the Contract Administrator" after the words "correct the default" in the second line.

(c) Paragraph GC 4.06.02(c) is amended by inserting the words "to the satisfaction of the Contract Administrator" at the end of this paragraph.

25. GC 4.08 TERMINATION OF CONTRACTOR'S RIGHT TO CONTINUE THE WORK

(a) Paragraph GC 4.08 is amended by the addition of the following paragraphs:

".03 The Owner has the right to terminate the Contract for wilful or persistent violation by the Contractor, Subcontractors or their respective workers of OHSA, WSIA or Environmental laws.

.04 Upon a termination of the Contract, the Owner may publish a notice of termination in the form and manner prescribed in the Construction Act. For greater certainty, a termination in accordance with this Contract will be effective whether or not a notice of termination is published."

26. GC 4.14 PERSONNEL EMPLOYED BY CONTRACTOR

(a) Add a new paragraph GC 4.14 as follows:

"GC 4.14 PERSONNEL EMPLOYED BY CONTRACTOR

.01 The Contractor shall not employ or hire any employees of the Owner."

SECTION GC 5.0 - MATERIAL

27. GC 5.02 QUALITY OF MATERIAL

(a) Paragraph GC 5.02.02 is deleted and replaced by the following:

".02 Materials supplied by the Contractor shall conform to the Ministry's list of designated sources for materials (latest edition) and shall conform to the requirements of the Contract, unless noted otherwise."

(b) Paragraph GC 5.02.04 is replaced with the following:

".01 The Contractor shall obtain for the Contract Administrator the right to enter onto the premises of the Material manufacturer or supplier to carry out such inspection, sampling and testing as specified in the Contract Documents or as requested by the Contract Administrator. No Material that has not been approved by the Owner shall be incorporated in the Work.

.02 Testing and inspection of Materials delivered to the Working Area for incorporation in the Work and workmanship on the Project will be conducted by the Owner under the direction of the Contract Administrator.

.03 Testing of previously tested material and/or workmanship shall be carried out at the Contract Administrator's discretion at the Contractor's expense."

(c) Paragraph GC 5.02 is amended by the addition of the following paragraph:

".10 If agreed upon by both parties, any surplus Material may be accepted by the Owner at the invoice cost of the Material only with no other mark-ups, F.O.B. in the Owner's yard."

28. GC 5.04 SUBSTITUTIONS

(a) Paragraph GC 5.04.03 is replaced by the following: "If the proposed substitution is approved by the Contract Administrator, the Contract Administrator and the Contractor shall negotiate an

appropriate price reduction; if the proposed substitution results in the use of a Material of higher quality, there shall be a price adjustment in accordance with the provisions of GC 3.10 CHANGES."

SECTION GC 6.0 – INSURANCE, PROTECTION AND DAMAGE

29. GC 6.01 PROTECTION OF WORK, PERSONS AND PROPERTY

(a) Paragraph GC 6.01.02 is modified by inserting the words "if the Contract Administrator so directs" following the words "restore such damage" in the fourth line.

(b) Paragraph GC 6.01 is amended by the addition of the following paragraph:

".06 When carrying out excavation work, the Contractor may encounter Utilities. The Contractor shall be fully responsible for any breakage or damage to any Utilities, and the Contractor shall pay the full cost of repairing such damage and making good any losses or damages caused as a result of its operation in carrying out this Contract."

30. GC 6.02 INDEMNIFICATION

(a) Paragraph GC 6.02.01 is amended by replacing the balance of the paragraph, commencing at "provided such claims are" with the words "by the Contractor or anyone for whom the Contractor is at law responsible".

(b) Paragraph GC 6.02.03 is deleted in its entirety.

(c) Paragraph GC 6.02 is amended by the addition of the following paragraph:

".06 If a claim, for which the Contractor indemnifies the Owner hereunder, arises prior to Substantial Performance of the Work and such claim is for an amount below the deductibles for the Contractor's insurance, the Contractor shall pay such claim to the Owner within fifteen (15) Days of resolution, provided that, if the claim is not resolved by Substantial Performance of the Work, the Owner may retain from any future payments to the Contactor, a reasonable estimate of such claim or the Contractor may deposit with the Owner the sum of $45,000 as security for the payment of such claim. If the claim is not resolved by Final Acceptance, the Owner may apply the current retained amount or the deposit against such claim."

31. GC 6.03.01 GENERAL

Paragraph GC 6.03.01 is amended by the addition of the following paragraph:

".03 For greater certainty, the Contractor shall be responsible for prompt payment of all deductible amounts in connection with the insurance coverages contemplated under this Contract."

32. GC 6.03.02 COMMERCIAL GENERAL LIABILITY INSURANCE

(a) Paragraphs GC 6.03.02.01 and GC 6.03.02.02 are replaced with the following:

".01 The Contractor shall obtain and maintain Comprehensive General Liability Insurance against Bodily Injury and Property Damage claims with respect to all Work. Such insurance shall:

a) name the Owner and all Subcontractors, either employed directly or indirectly in the Work, as additional insureds;

b) contain a Cross Liability clause;

c) include coverage for:

(i) Completed Operations, which coverage shall be maintained continuously in force for a period of not less than 24 months from the date of Final Acceptance

(ii) Blanket Contractual Liability

(iii) Contingent Employers Liability

(iv) Non-owned Automobile Liability

(v) Broad Form Property Liability

(vi) Excavation

d) where applicable, include coverage for:

(i) Underpinning, shoring

(ii) Demolition

(iii) Building raising or moving

(iv) Blasting or the Use of Explosives

(v) Tunnelling

(vi) Pile driving, caisson work

(vii) Use of aircraft or watercraft, owned or non-owned

e) contain a paragraph stating that such insurance shall remain in force and not be amended, cancelled or allowed to lapse without 30 Days prior written notice being given to each of the named insureds;

f) be subject to a limit of not less than $5,000,000.00 inclusive per occurrence for Bodily Injury, Death and Damage to Property, including loss of use thereof;

02. Prior to the commencement of any Work under this Contract, the Contractor shall file with the Owner, to the attention of the City Clerk, the certificates contemplated in GC 6.03.01.02."

(b) Paragraph GC 6.03.02.03 is revised to add the following sentence at the beginning of the paragraph: "The insurance required under the Contract Documents shall be maintained continuously from the commencement of the Work until the end of the Warranty Period."

33. GC 6.03.05.01 PROPERTY INSURANCE

(a) Paragraph GC 6.03.05.01.01 is replaced with the following:

".01 All risks property insurance shall be in the name of the Contractor, with the Owner and the Contract Administrator named as additional insureds, insuring not less than the sum of the amount of the Contract price and the full value, as may be stated in the Contract Documents, of Material that is specified to be provided by the Owner for incorporation into the Work, with a deductible not exceeding 1% of the amount insured at the site of the Work."

34. GC 6.03.05.04 PAYMENT FOR LOSS OR DAMAGE

(a) Paragraph GC 6.03.05.04.03 is amended by inserting the words "for whom the Owner is at law responsible" following the word "others" at the beginning of the second line of paragraph GC 6.03.05.04.03.

35. GC 6.03.06 CONTRACTOR'S EQUIPMENT INSURANCE

(a) Paragraph GC 6.03.06 is amended by the addition of the following paragraph:

".02 If this Contract includes the construction of or alterations to a bridge, dam, culvert or building, the Contractor shall provide Property Insurance, to insure the Work against all risks including flood and earthquake."

36. GC 6.03.08 INSURANCE CLAIMS

(a) Add a new GC 6.03.08 INSURANCE CLAIMS as follows:

"**GC 6.03.08 INSURANCE CLAIMS:**

.01 It shall be the duty of the Contractor to fully comply with the terms and conditions of the Liability Insurance coverage, including, without limiting the generality of the foregoing, the requirement to promptly report claims to the insurer.

.02 The Contractor shall also promptly notify the Contract Administrator of all such claims in writing.

.03 If a claim is settled, the Contractor shall thereupon provide the Contract Administrator with a copy of the claimant's release.

.04 If a claim is rejected, the Contract Administrator shall be notified at the time of rejection.

.05 If a claim is not responded to by the Contractor within 15 Days after the claim has been received by the Contractor, the Owner may, at its sole option, elect to respond to and settle the claim on terms acceptable to the Owner, in its sole discretion, and charge all costs and expenses incurred by the Owner in responding to and settling the claim, including, without limitation, legal costs (on a substantial indemnity basis) to the Contractor.

.06 The Contract Administrator shall be provided full information as to such claim at all times as the Contract Administrator may require until the claim is settled and in any event should 30 Days elapse after the claim has been received by the Contractor and the Contractor is not able to report settlement or rejection of the claim, the Contractor will provide a full report to the Contract Administrator as to the status of and steps being taken with respect to the claim.

.07 The Owner reserves the right to report any claim directly to the insurer.

.08 Final Acceptance shall not occur until all claims are settled, paid, withdrawn or discontinued or the Owner is satisfied that all claims are being adequately addressed by the Contractor and/or its insurer."

37. GC 6.04 BONDING

(a) Paragraphs GC 6.04.01 and GC 6.04.02 are replaced by the following:

".01 The Contractor shall prior to commencement of the Work, provide to the Owner a performance bond, in the form required by the Construction Act, in an amount equal to 100% of the Contract price, covering the performance of the Contract, including the Contractor's requirements with respect to the correction of deficiencies and the fulfillment of all warranties.

.02 The Contractor shall prior to commencement of the Work, provide to the Owner a labour and material payment bond, in the form required by the Construction Act, in an amount equal to 50% of the Contract price covering payment for labour, Product, or both.

.03 The bonds referred to in paragraph GC 6.04 shall be issued by a duly licensed surety company authorized to transact the business of suretyship in the province of Ontario and shall be maintained in good standing until the fulfillment of the Contract, including all warranty and maintenance periods set out in the Contract Documents. Unless otherwise stated in the Contract Documents, the form of such bonds shall be in accordance with the form of bonds set out in the Construction Act.

.04 It is the intention of the parties that the performance bond shall be applicable to all of the Contractor's obligations in the Contract Document and, wherever a performance bond is provided with language which conflicts with this intention, it shall be deemed to be amended to comply. The Contractor represents and warrants to the Owner that it has provided its surety with a copy of the Contract Documents prior to the issuance of such bonds."

SECTION GC 7.0 – CONTRACTOR'S RESPONSIBILITIES AND CONTROL OF THE WORK

38. GC 7.01.02 COMMENCEMENT OF THE WORK

(a) Paragraph GC 7.01.02 is replaced with the following:

".02 The Contractor shall commence the Work within 7 Days after receiving a notice from the Contract Administrator to commence the Work ("**Notice to Proceed**"). The Contractor will not commence the Work until the Contract has been officially accepted by the Owner, the insurance certificates and the bonds

are satisfactory to the Owner, and the Contractor has received a Notice to Proceed."

39. GC 7.01.03 CONTROL AND RESPONSIBILITY

(a) Paragraph GC 7.01.03.01 is amended by inserting the words "and conduct and complete the Work in a first class and workmanlike manner" at the end of the first sentence.

(b) Paragraph GC 7.01.03.01 is further amended by inserting the following at the end of this paragraph: "The Contractor shall comply with all Applicable Laws which are or become enforced during the performance of the Work and which relate to the Work. If the standards of the Applicable Laws relating to the Work differ, the most stringent standards shall govern." (c) Paragraph GC 7.01.03.02 is replaced with the following:

".02 The Contractor shall provide adequate labour, Equipment, and Material to ensure the completion of the Contract in accordance with the Contract Documents."

(d) Paragraph GC 7.01.03.04 is amended by adding the following at the end of this paragraph: "The Contractor shall engage and pay for Engineers skilled in the appropriate disciplines to perform those functions referred to in the preceding sentence where required by Applicable Law or by the Contract Documents and in all cases where such temporary supports, structures and facilities and their method of construction are of such a nature that professional engineering skill is required to produce safe and satisfactory results."

(e) Paragraph GC 7.01.03.05 is replaced with the following:

".05 The Contractor shall comply with and conform to all Applicable Laws applicable to the Work to be provided by, and the undertakings and obligations of, the Contractor under this Contract."

40. GC 7.01.04 COMPLIANCE WITH OCCUPATIONAL HEALTH AND SAFETY ACT

(a) Paragraph GC 7.01.04.01 is amended by inserting the following words at the beginning of this paragraph: "The Contractor shall be solely responsible for construction safety at the Working Area and".

(b) Paragraph GC 7.01.04.01 is amended by the addition of the following paragraph:

"(h) The Contractor shall conduct all Work in accordance with the Owner's "Contractor Safety Policy" referred to in GC 3.16."

41. GC 7.01.05 CONTRACTOR'S REPRESENTATIVES

(a) Paragraph GC 7.01.05.01 is amended by inserting the words: "who shall be a competent qualified superintendent" following the words "authorized representative on the site" in the first line and by inserting the following at the end of this paragraph: "The authorized representative shall not be changed without the approval of the Contract Administrator and only if replaced by a superintendent of similar qualifications. Notices and instructions given to the authorized representative by the Contract Administrator shall be held to have been received by the Contractor."

42. GC 7.01.06 ASSISTANCE TO THE CONTRACT ADMINISTRATOR

(a) Add the following to the end of GC 7.01.06.01: "The Contractor shall furnish the Contract Administrator or any of his assistants with all reasonable help which may be required at any time in driving stakes or laying out the Work. The Contractor will require no additional compensation for this."

43. GC 7.01.07 SCHEDULE

(a) Paragraph GC 7.01.07.01 is amended by inserting the words: "and provide sufficient detail of the critical activity as required by the Contract Administrator" at the end of the first sentence.

(b) Paragraph GC 7.01.07.01 is further amended by replacing the words "materially affected by changes in the work" with the words "materially affected by changes in the Work".

(c) Paragraph GC 7.01.07.01 is further amended by inserting the following at the end of this paragraph: "The Contractor shall otherwise update the schedule every two weeks or as stipulated by the Contract Documents and advise the Contract Administrator of any revisions required to the schedule as a result of extensions of the Contract Time."

44. GC 7.01.08 ERRORS AND INCONSISTENCIES RELATING TO THE CONTRACT

(a) Paragraph GC 7.01.08.01 is amended by inserting at the beginning of this paragraph: "The Contractor shall review the Contract Documents and" and replacing "Where" with "where".

45. GC 7.01.09 UTILITIES

(a) Replace paragraph GC 7.01.09.01 with the following:

".01 The Contractor shall arrange with the appropriate Utility authorities for the stake out of all underground Utilities and service connections, which may be affected by the Work. The Contractor shall be responsible, at its expense, for any damage or interference to the Utilities, pole lines, pipe lines, conduits, farm tiles or other public or privately owned works or property by the Contractor or by those for whom the Contractor is responsible at law, during construction. The Contractor shall attend such meetings with the Contract Administrator and the Utility authorities for each Utility affected by the Contract. The Contractor shall notify the local gas authority at least 48 hours in advance of the commencement of any Work, which may affect pipes belonging to the gas Utility company. The locate boundaries shall include areas required for Owner layout and work activities required by the Owner. The Contractor shall provide to the Owner a copy of the locate paperwork."

(b) Paragraph GC 7.01.09 is amended by the addition of the following paragraph:

".03 The Contractor shall notify the local gas authorities at least 48 hours in advance of the commencement of any Work which may affect pipes belonging to the gas utility company. Any specific requirements of the gas utility company in connection with daylighting its high pressure mains, having its inspection personnel on site when the Work is being carried out and any other requirements, shall be strictly complied with by the Contractor, and no additional payment in connection therewith shall be made by the Owner to the Contractor."

46. GC 7.01.10 COORDINATION AND SUPPORTING WORKS

(a) Insert a new subsection "Coordination and Supporting Works" at the end of GC 7.01 as follows:

"**GC 7.01.10 Coordination and Supporting Works**

.01 To co-ordinate the Work, the Contractor or a person authorized to act for the Contractor will attend regular meetings with the Contract Administrator or his or her representative during the Contract Time, at a time and place to be decided by the Contract Administrator.

.02 The Contractor shall install at its own expense all sheeting and shoring required to support trenches or to protect existing structures or works. The Contractor is responsible for obtaining the certificates from an Engineer that all shoring will meet Ministry of Labour safety requirements. Evidence of such certification shall be provided to the Contract Administrator.

.03 The Contractor shall provide for efficient drainage of all sections of the Work during all stages of construction at its own expense. The Contractor will be responsible for all damage which may be caused through its failure to provide proper drainage facilities. The Contractor shall restore any existing drainage works which are disturbed as a result of its Work."

47. GC 7.02 MONUMENTS AND LAYOUT

(b) Replace paragraphs GC 7.02.06, GC 7.02.07, GC 7.02.08 and GC 7.02.09 by the following paragraphs:

".03 The Contractor will give the Contract Administrator at least 48 hours notice in writing before requiring any levels, lines, or stakes, in connection with the Work. The Contractor shall clearly state in such notice the exact location where levels, lines, or stakes are required. The Contractor must satisfy itself before commencing the Work as to the meaning and correctness of all stakes and marks, and no claim will be entertained by the Owner for or on account of any alleged inaccuracies, unless the Contractor notified the Contract Administrator of such inaccuracies in writing before commencing the Work.

.04 The Contractor will be held responsible for the preservation of all stakes, marks, reference points, benchmarks and Monuments in their proper positions, and where any of them are disturbed, lost or destroyed, it shall at once notify the Contract Administrator in writing, and all expenses incurred in replacing them will be billed against the Contractor and, if not paid by the Contractor, will be deducted from any monies due the Contractor under the Contract.

.05 All stakes and marks set will not in every case represent all the grades, levels, lines, angles or surfaces in the finished work, and in this regard the Contractor shall ensure that such stakes and marks are read correctly and used in a manner consistent with the Plans, details, Specifications and directions of the Contract Administrator. Should the Contractor discover or suspect any errors in stakes, lines, and grades which have been established for its use, the Contractor shall at once discontinue the work until such suspicions are investigated and any errors or misunderstanding rectified, but no claims shall be made or allowed on this account, or because of any resulting delay.

.06 The Contractor shall provide the layout for all Work unless otherwise noted."

48. GC 7.03 WORKING AREA

(a) Paragraph GC 7.03.01 is amended by inserting the words "waste products and" prior to the word "debris" in the second line.

(b) Paragraph GC 7.03 is amended by the addition of the following paragraphs:

".06 The location of all temporary buildings used for construction purposes must be submitted to the Contract Administrator for approval before erection work commences. Temporary buildings must be kept clean and sanitary and must not become a hazard to health or a nuisance to the adjoining properties.

.07 The Contractor shall ensure that during night Work the Working Area is adequately floodlit to the Contract Administrator's satisfaction for Work operations, inspections and advance warning to traffic.

.08 Streets beyond the limits of the Working Area and other construction areas shall be kept clean. Dusty materials shall be transported in covered haulage vehicles. Wet materials shall be transported in suitable watertight haulage vehicles.

.09 The Contractor shall take such steps as may be required to prevent dust nuisance resulting from its operations either within the limits of the Working Area or elsewhere or by public traffic where it is the Contractor's responsibility to maintain a Roadway through the Work.

.10 Where the Work requires the sawing of asphalt or the sawing or grinding of concrete, blades and grinders of the wet type shall be used together with sufficient water to prevent the incidence of dust, wherever dust would affect traffic or wherever dust would be a nuisance to residents in the vicinity of the Working Area.

.11 Permitted dust control measures may include the application of calcium chloride, tall oil emulsion or water. In general, the use of calcium chloride and tall oil emulsion shall be kept to a minimum and is restricted to vehicle rights-of-way; there shall be more frequent applications of water in close proximity to watercourses. The Contract Administrator's acceptance shall be obtained before chemicals or tall oil emulsion for dust control are used."

49. GC 7.06 MAINTAINING ROADWAYS AND DETOURS

(a) Replace paragraph GC 7.06.07 as follows:

".07 The Contractor will bear the cost of maintaining, in a satisfactory condition for traffic, a Roadway through the Working Area, all in accordance with the Ontario Traffic Manual's Book 7 (Temporary Conditions). The Roadway through the Working Area will include any detour constructed in accordance with the Contract Documents or required by the Contract Administrator. Compensation for all labour, equipment and materials to do this work and to maintain the Roadway, including the cost of grading required to maintain the surface of such Roadway and detours, shall be deemed to be included in the prices bid for the various tender items and no additional payment will be made by the Owner."

(b) A new paragraph GC 7.06.12 is added as follows:

".12 In order to satisfy the Owner that the Contractor has addressed concerns regarding traffic control and safety in accordance with Ontario Traffic Manual's Book 7 (Temporary Conditions), the Contractor shall submit to the Contract Administrator a sketch indicating its proposed method of barricades and/or signage for each of the Working Areas contemplated in the Contract Documents. This information shall be available for review and approval by the Contract Administrator at the Contract preconstruction meeting."

50. GC 7.08 APPROVALS AND PERMITS

(a) Paragraph GC 7.08.01 is amended by adding the words "and shall ensure its Subcontractors" after the words "the Contractor shall" in the first line.

(b) Paragraph GC 7.08 is amended by the addition of the following paragraphs:

".03 All such inspections shall be at the expense of the Contractor.

.04 The Contractor will notify, obtain inspections and approvals from, and co-operate with all other Persons involved or affected by the Work, such Utility and railway companies."

51. GC 7.09 SUSPENSION OF WORK

(a) Paragraph GC 7.09 is amended by the addition of the following paragraphs:

".02 The Contract Administrator may stop any portion of the Work, if in his or her judgment, the weather is such as to prevent the Work from being properly done. No compensation of any kind will be made for such stoppage except an extension of time for the Completion of the Work as provided in GC 3.07.

.03 The Contractor shall, upon written notice from the Contract Administrator, discontinue or delay any or all Work of base, foundation, or paving construction on any section of any Roadway or Highway, if, in the opinion of the Contract Administrator, the foundation is not sufficiently compacted or settled for surfacing work in question, and the Work shall not be resumed until the Contract Administrator shall in writing so direct, and the Contractor shall not be entitled to any compensation for such stoppage or delay to the Work, other than an extension of time for the Completion of the Work as provided in GC 3.07."

52. GC 7.10 CONTRACTOR'S RIGHT TO STOP THE WORK OR TERMINATE THE CONTRACT

(a) Paragraph GC 7.10.02 is deleted in its entirety.

(b) Paragraph GC 7.10.03(b) is amended by replacing the words "an arbitrator or court" with "a court within a reasonable time".

(c) Paragraph GC 7.10.03(c) is amended by inserting the words "to a substantial degree and the Contract Administrator confirms by written statement to the Contractor that such cause exists" at the end of the paragraph.

(d) Paragraph GC 7.10.04 is amended by replacing "7 days" with "15 Working Days".

(e) Paragraph GC 7.10.05 is amended by inserting the words "reasonably foreseeable" prior to the words "losses or damages" in the third line.

(f) Paragraph GC 7.10 is amended by the addition of the following paragraph:

".06 If the Contractor stops the Work or terminates the Contract in accordance with the paragraphs above, the Contractor shall leave the Working Area and the Work in a secure position."

53. GC 7.12 ENVIRONMENTAL INCIDENT MANAGEMENT UNDER LEGISLATION PROTECTING THE ENVIRONMENT AND NATURAL RESOURCES

(a) Paragraph GC 7.12.01 is amended by inserting, following the words "with the requirements of" the words "all Applicable Laws, including, without limitation,".

(b) Paragraph GC 7.12 is amended by the addition of the following paragraphs:

".06 Any Release of a Hazardous Substance under the control of the Contractor, or those for whom the Contractor is responsible at law, and any Release of a Hazardous Substance that is a result of the Contractor's operations, or operations of those from whom the Contractor is responsible at law, shall forthwith be reported to the Contract Administrator.

.07 All Releases of liquid, other than accumulated rainwater from luminaires, internally illuminated signs, lamps and liquid type transformers under the control of the Contractor, and all Releases from Equipment that are a result of the Contractor's operations, or operations of those for whom the Contractor is responsible at law, shall, unless otherwise indicated in the Contract, be assumed to contain Polychlorinated biphenyls or PCBs and shall forthwith be reported to the Contract Administrator. This reporting will not relieve the Contractor of its legal responsibilities under the Contract or under Environmental Laws regarding such Releases."

54. GC 7.14 LIMITATIONS OF OPERATIONS

(a) Amend paragraph GC 7.14.01 by deleting the word "Saturdays,".

(b) Paragraph GC 7.14 is amended by the addition of the following paragraph:

"03. The Contractor will co-operate with the employees of the Owner or other contractors working on the same or related projects. The Contractor will notify, obtain approvals from, and co-operate with all other Persons involved or affected by the Work, such as Utility and railway companies."

55. GC 7.15 CLEANING UP BEFORE ACCEPTANCE

(a) Amend paragraph GC 7.15.01 by inserting the words ", waste products" following the words "temporary works" in the third line of this paragraph.

(b) Amend paragraphs GC 7.15.01 and GC 7.15.02 by replacing the words "or others" by "or others who are not the responsibility of the Contractor".

56. GC 7.16 WARRANTY

(a) Amend paragraph GC 7.16.02 to read:

".02 Subject to GC 7.16.01, the Contractor shall correct promptly, at no additional cost to the Owner, defects and/or deficiencies in the Work which appear prior to and during the longest of (a) 12 months from the date of Substantial Performance of the Work, as set out in the Certificate of Substantial Performance of the Work; (b) where there is no Certificate of Substantial Performance, 12 months from the date of Completion of the Work as set out in the Completion Certificate; and (c) such longer period as may be specified for certain Materials or Work. The Contract Administrator will promptly give the Contractor written notice of observed defects or deficiencies."

(b) Paragraph GC 7.16 is amended by the addition of the following paragraphs:

".04 The Contractor shall be responsible for the maintenance of all trenches for a period of 2 years from the date of the Final Acceptance Certificate. Any shrinkage or settlement during this period will be made good by the Contractor at his own expense. This shall also include making good any other works affected.

.05 Deficiencies and defects shall be completed within 30 Days of being reported except where carry over of the construction season affects schedule. In this case, all deficiencies shall be completed no later than the next June 30.

.06 The Contractor shall be responsible for a two (2) year warranty on all new trees planted under the Contract. This shall include 2 full growing seasons from the date of the Final Acceptance Certificate. Any trees found to be unhealthy over this period will be replaced by the Contractor.

.07 The Contractor shall commence to correct any deficiency within 5 Days after receiving a notice from the Owner or Contract Administrator, and complete the Work as expeditiously as possible, except that in case the deficiency would prevent the use of the Roadway, in which case all necessary corrections and/or installation of temporary replacements shall be carried out immediately as an emergency service. Emergency service shall include without limitation watermain service breaks, sewer back-up, traffic signal outage and any significant holes or depressions in the travelled portion of Roadways. Should the Contractor fail to initiate a response to emergency service within 2 hours of a request made during normal business hours of the Contractor, the Owner is authorized, regardless of GC 7.01.03.01, to carry out all necessary repairs or replacements at the Contractor's expense. The carrying out of replacement work and the making good of defects shall be at the sole cost of the Contractor and shall be executed at times convenient to the Owner. In addition to any other rights of the Owner under the Contract, the Owner reserves the right to deduct costs and expenses related to emergency service from the Maintenance Security Holdback."

(c) Add a new paragraph GC 7.19 as follows:

"**GC 7.19 AODA**

.01 Prior to the commencement of the Work, the Contractor shall also furnish evidence of compliance with requirements of the AODA, including training for staff, and/or the Owner may, at its discretion, provide such training if the Contractor."

SECTION GC 8.0 - MEASUREMENT AND PAYMENT

57. GC 8.01.02 VARIATIONS AND TENDER QUANTITIES

(a) Amend paragraph 8.01.02.01(a) to read:

"(a) In the case of a Major Item where the quantity of Work performed and/or Materials supplied by the Contractor exceeds the tender quantity by more than 15%, the Owner may make a written request to the Contractor to reduce the unit price for that portion of the Work performed or Materials supplied or both which exceeds 115% of the tender quantity based on the portion of the actual overheads and fixed costs applicable to the amount of the overrun in excess of 115% of the tender quantity. For purposes of the negotiations, the overheads and fixed costs applicable to the Major Item are deemed to have been prorated uniformly over 100% of the tender quantity for the item. Overhead costs shall be confirmed by a statement certified by the Contractor's senior financial officer or auditor and may be audited by the Owner. Alternatively, where both parties agree, a reduction equal to 10% of the unit price of the amount of the overrun in excess of 115% of the tender quantity, will be made."

58. GC 8.02.03 ADVANCE PAYMENTS FOR MATERIAL

(a) Amend paragraph GC 8.02.03.01 to read:

".01 Provided that the Contractor provide the Owner with all of the documents required under this paragraph GC 8.0 and for a Proper Invoice for the applicable compensation sought, the Owner may make advance payments for Material intended for incorporation in the Work upon the written request of the Contractor and according to the following terms and conditions:

(a) the Contractor shall deliver the Materials to a Working Area approved by the Contract Administrator, and the Contractor shall, in advance of receipt of shipment of the Material, arrange for adequate and proper storage facilities and notify the Contract Administrator of their location(s);"

(b) The remainder of paragraph GC 8.02.03.01 is unchanged.

(c) Paragraph GC 8.02.03 is amended by the addition of the following paragraph:

".03 The Owner will not make advance payments for Material under this Contract.

59. GC 8.02.04.01 PROGRESS PAYMENT

(a) Replace paragraph GC 8.02.04.01.01 with the following:

".01 After starting the Work on this Contract, the Contractor shall, monthly or at intervals specified in the Contract Documents, submit to the Contract Administrator and to the Owner, an application for payment for up to the amount estimated by the Contract Administrator for the applicable interval. Such application for payment shall contain all of the information and documents required of a Proper Invoice and this Contract for progress payments."

(b) Replace paragraph GC 8.02.04.01.02 with the following:

".02 Payment shall be made within 28 Days of the Contract Administrator's receipt of an application for payment that meets the requirements of paragraph GC 8.02.04.01.01,

subject to holdbacks required under the Construction Act and the delivery of a notice of non-payment issued by the Owner in the form prescribed under the Construction Act."

(c) Delete paragraphs GC 8.02.04.01.03 and GC 8.02.04.01.04.

60. GC 8.02.04.03 SUBCONTRACT STATUTORY HOLDBACK RELEASE CERTIFICATE AND PAYMENT

(a) Paragraph GC 8.02.04.03.01 is amended by inserting the words "Subject to GC 8.02.04.03.02 and the receipt by the Owner of all of the documents and information required for a Proper Invoice," at the beginning of the paragraph.

(b) Paragraph GC 8.02.04.03 is amended by the addition of the following paragraph as GC 8.02.04.03.02 and the balance of 8.02.04.03 is renumbered accordingly:

".02 If any lien is registered, or the Owner receives notice of any claim for lien, or the Owner reasonably believes that any party may retain or has retained any right, title or interest to Materials in respect of which an application for payment has been made including, without limitation, a claim under the *Personal Property Security Act* (Ontario), a lien, attachment or secured claim, then the Owner may, subject to the delivery by the Owner of a notice of non-payment under the Construction Act, hold back from the money due to the Contractor hereunder, in addition to any statutory lien holdbacks, sufficient monies to cause a discharge or vacation of the registration of any such lien or any certificate of action relating thereto, and the Contractor hereby indemnifies the Owner completely against such lien or claim for lien or proceedings arising therefrom and from all expenses and costs related thereto, including, but not limited to, legal fees and disbursements on a full indemnity basis. In addition, the Contractor agrees as follows:

(a) to discharge the lien rights of any consultants, Subcontractors, supplier, worker or workers' trust fund involved in the Work and avoid their preserving or giving written notice of any lien, or both, the Contractor shall not include "pay when paid" or "pay if paid" clauses in any agreements with any such persons, and the Contractor shall pay all such persons, with whom it has privity of contract, as their materials or services are supplied to keep its accounts with them current and in any event before such person's lien rights expire.

(b) the Contractor shall, when requested to do so by the Owner, cause any and all construction liens registered by any Subcontractor or supplier, to be discharged or vacated by the Contractor posting appropriate security and the Contractor shall do so within 10 Days of that request at its sole expense.

(c) the Contractor shall, when requested to do so by the Owner, cause any and all written notices of lien given to any Person by any Subcontractor or supplier, to be withdrawn and the Contractor shall do so within 10 Days of that request at its sole expense.

(d) should the Contractor fail to discharge or vacate any such lien, or to have any such written notice of lien withdrawn, then the Owner, may at its option, do so and set off and deduct from any amount owing to the Contractor, all costs and expenses of so doing including the costs of borrowing the appropriate cash, letter of credit or bond as security and legal fees and disbursements. If there is

no amount owing by the Owner to the Contractor, then the Contractor shall reimburse the Owner for all of the said costs and expenses of so doing.

(e) the Order discharging or vacating any such lien shall include the following clause: "THIS COURT ORDERS THAT any written notice of the said lien shall no longer bind any person to whom it was given."

(f) the Contractor and its surety, its respective administrators, successors and assigns and any and all other parties in any way concerned, shall indemnify the Owner and all its officers, servants, agents and employees including all successors or its assigns from any and all liability or expenses of any nature whatsoever and in particular its incurred legal costs in respect of any claim or any liability under the Construction Act or to any attachment for debt, garnishment process or otherwise. The Owner shall not in any cases and/or action or application be liable to any greater extent than the amount owing by it to the Contractor, or the Contractor's respective administrators, successors and assigns."

(g)

61. GC 8.02.04.04 SUBSTANTIAL PERFORMANCE OF WORK

(a) Paragraph GC8.02.04.04.01 is replaced with the following:

".01 When the Contractor considers that the Contract has been substantially performed, it shall submit to the Contract Administrator an application for payment of the holdback amount containing:

(a) an itemized list of the outstanding Work;

(b) all of the information and documents required of a Proper Invoice;

(c) a release by the Contractor in a form satisfactory to the Contract Administrator releasing the Owner from all further claims relating to the Contract, qualified by stated exceptions such as outstanding work or matters arising out of subsection GC 3.13, Claims, Negotiations, Mediation;

(d) proof of publication of the Certificate of Substantial Performance; and

(e) all final reports and certificates confirming satisfactory completion of all commissioning and testing required by the Contract Documents, to the extent applicable, and all manuals, as-built drawings and other turnover documents required under the Contract Documents.

.02 Notwithstanding the foregoing, if the Contractor has not provided the documents required by paragraph GC8.02.04.04.01 by the 30th Day after the publication of the certificate of Substantial Performance of the Work (or the Completion of the Work, whichever is earlier), the Owner, at its discretion, shall be entitled to withhold an amount equal to up to the full amount of the amount of statutory holdback as security for the Contractor's delivery of the outstanding document(s) and information. In the event of a withholding

under this paragraph GC8.02.04.04.02, the Owner shall pay the withheld amount to the Contractor upon the Contractor's delivery of such documents and information."

(b) Paragraphs GC8.02.04.04.02, GC8.02.04.04.03, GC8.02.04.04.04, and GC8.02.04.04.05 are renumbered as paragraphs GC8.02.04.04.03, GC8.02.04.04.04, GC8.02.04.04.05, and GC8.02.04.04.06, respectively.

62. GC 8.02.04.05 SUBSTANTIAL PERFORMANCE PAYMENT AND SUBSTANTIAL PERFORMANCE STATUTORY HOLDBACK RELEASE PAYMENT CERTIFICATES

(a) Replace GC 8.02.04.05 in its entirety with the following:

".01 The Substantial Performance Statutory Holdback Release Payment Certificate shall be a payment certificate releasing to the Contractor the Statutory Holdback and any other holdback amount authorized by the Substantial Performance Statutory Holdback Release Payment Certificate. Subject to the delivery by the Owner of a notice of non-payment under the Construction Act and the provisions of the Construction Act, payment of the Statutory Holdback and any other holdback amount authorized by the Substantial Performance Statutory Holdback Release Payment Certificate shall be due 61 Days after the date of publication of the Certificate of Substantial Performance.

.02 Any amount of security retained by the Owner shall be identified in the Substantial Performance Payment Certificate."

63. GC 8.02.04.06 CERTIFICATION OF COMPLETION

(a) Paragraph GC 8.02.04.06.01 is replaced with the following:

".01 When the Contractor considers that the Work is Complete, the Contractor shall submit an application for final payment containing:

(a) all of the documents and information required under the Contract or for a Proper Invoice;

(b) a written request for release of the Statutory Holdback for finishing work, including a release by the Contractor in a form satisfactory to the Contract Administrator releasing the Owner from all further claims relating to the Contract, qualified by stated exceptions where appropriate; and

(c) all final reports and certificates confirming satisfactory completion of all required commissioning and testing, to the extent applicable."

64. GC 8.02.04.07 COMPLETION PAYMENT AND COMPLETION STATUTORY HOLDBACK RELEASE PAYMENT CERTIFICATES

(a) Replace paragraph GC 8.02.04.07.01 with "[Not Used.]".

(b) Replace paragraph GC 8.02.04.07.02 with the following:

".02 The Completion Statutory Holdback Release Payment Certificate shall be a payment certificate releasing to the Contractor the Statutory Holdback for finishing work. Subject

to the delivery by the Owner of a notice of non-payment under the Construction Act and the provisions of the Construction Act, payment of the Statutory Holdback and any other holdback amount authorized by the Completion Statutory Holdback Release Payment Certificate shall be due 61 Days after the date of publication of the Completion Statutory Holdback Release Payment Certificate."

(c) Paragraph GC 8.02.04.07.04 is amended by the addition of the following paragraph:

".04 As of the date of the Completion Payment, the Contractor expressly waives and releases the Owner from all claims against the Owner including, without limitation, those that may arise from negligence or breach of Contract by the Owner except those made in writing prior to the Completion Payment and still unsettled."

65. GC 8.02.04.08 INTEREST

(a) Replace paragraph GC 8.02.04.08 as follows:

".01 The Contractor shall not be entitled to claim, and the Owner shall not be required to pay, interest except in accordance with the Construction Act."

66. GC 8.02.04.09 INTEREST FOR LATE PAYMENT

(a) Delete paragraph GC 8.02.04.09 in its entirety.

67. GC 8.02.04.10 INTEREST FOR NEGOTIATIONS AND CLAIMS

(a) Delete paragraph GC 8.02.04.10 in its entirety.

68. GC 8.02.04.11 OWNER'S SET-OFF

(a) GC 8.02.04.11.01 is revised to read:

".01 Subject to the Construction Act, the Owner may retain from monies owing to the Contractor under this or any other contract with the Contractor an amount sufficient to cover any outstanding or disputed liabilities including, without limitation, the cost to remedy deficiencies, the reduction in value of substandard portions of the Work, claims for damages by third parties which have not been determined in writing by the Contractor's insurer, undetermined claims by the Owner under paragraph (a) of paragraph GC 8.01.02.01, Variations in Tender Quantities, any assessment due the Workplace Safety and Insurance Board, and any monies to be paid to the workers in accordance with paragraph GC 8.02.10, Payment of Workers as well any liquidated damages assessed by the Owner pursuant to paragraph GC8.02.09."

69. GC 8.02.04.12 DELAY IN PAYMENT

(a) GC 8.02.04.12 is deleted in its entirety.

70. GC 8.02.05.05 PAYMENT FOR MATERIAL

(a) Add the following at the end of the sentence: "Surplus Material not used on the Project may be purchased by the Owner at a cost not to exceed the cost of such Material, that is, invoice cost and no mark-up."

71. GC 8.02.05.06.02 STAND-BY TIME

(a) Replace paragraph GC 8.02.05.06.01 and GC 8.02.05.06.02 with the following:

".01 The Owner is not liable to pay Stand-by Time for any labour or equipment rental under this Contract."

72. GC 8.02.05.07 PAYMENT FOR HAND TOOLS

(a) Add the following at the end of the paragraph: ", including chain saws, cut off saws, portable generators, chipping/jack hammers, blades and drills, and electric hand tools. No payment shall also be made with respect to the Contractor's staff vehicles and equipment including any tool truck."

73. GC 8.02.05.08 PAYMENT FOR WORK BY SUBCONTRACTORS

(a) Revise paragraph GC 8.02.05.08.01(a), (b) and (c) to be replaced with the following: "5% of the amount".

74. GC 8.02.05.09.04 SUBMISSION OF INVOICES

(a) Revise paragraph GC 8.02.04.09.04 to read: "The final summary as per paragraph 8.02.05.09.02 shall be submitted by the Contractor within 30 Days after the completion of the Work on a Time and Material Basis."

75. GC 8.02.06 FINAL ACCEPTANCE CERTIFICATE

(a) Replace paragraph GC 8.02.06.02 with "[Not Used.]".

76. GC 8.02.09 LIQUIDATED DAMAGES

(a) Replace paragraph GC 8.02.09 with the following:

"GC 8.02.09 Time for Completion and Liquidated Damages

.01 **Time**

Time shall be strictly of the essence of this Contract.

.02 **Progress of the Work and Time for Completion**

(a) The Contractor shall complete this Contract in its entirety by the Completion date specified in the Tender form.

(b) If the time limit specified is not sufficient to permit Completion of the Work by the Contractor working a normal number of hours each Day or week on a single daylight shift basis, it is expected that additional and/or augmented daylight shifts will be required throughout the life of the Contract to the extent deemed necessary by the Contractor to ensure that the Work will be completed within the time limit specified. Any additional costs occasioned by compliance with

these provisions will be considered to be included in the prices bid for the various items of Work and no additional compensation will be allowed therefor.

(c) An extension of Contract Time may be granted in writing by the Contract Administrator in his or her sole discretion in the event of the Work being delayed beyond the prescribed time for Completion. Such extension shall be for such time as the Contract Administrator may prescribe and the Contract Administrator shall fix the terms on which such an extension may be granted. An application for an extension of Contract Time shall be made in writing by the Contractor to the Owner at least 15 Working Days prior to the date of Completion fixed by the Contract. The date of expiry of all bonds and other surety furnished to the Owner by the Contractor shall be extended at the expense of the Contractor.

(d) Any extension of Contract Time that may be granted to the Contractor shall be so granted and accepted without prejudice to any rights of the Owner whatsoever under this Contract and all of such rights shall continue in full force and effect after the time limited in this Contract for Completion of the Work and whenever in this Contract power or authority is given to the Owner or the Contract Administrator or any Person to take any action consequent upon the act, default, neglect, delay, breach, non-observance or non-performance by the Contractor in respect of the Work or Contract or any portion thereof, such powers or authorities may be exercised from time to time, and not only in the event of the happening of such contingencies before the time limited in this Contract for the Completion of the Work but also in the event of the same happening after the time so limited in the case of the Contractor being permitted to proceed with the execution of the Work under an extension of Contract Time granted by the Owner. In the event of the Owner granting an extension of Contract Time, time shall continue to be deemed strictly of the essence of this Contract.

.03 **Liquidated Damages**

(a) It is agreed by the Parties to the Contract that in case all the Work called for under the Contract is not finished by the Completion date specified in the Tender form or as amended by the Contract Administrator, damage will be sustained by the Owner, and that it is and will be impracticable and extremely difficult to ascertain and determine the actual damage which the Owner will sustain in the event of and by reason of such delay and the Parties therefore agree that the Contractor will pay to the Owner the sum of **$1,000.00** for Liquidated Damages for each and every Day's delay in completing the Work beyond the date of Completion prescribed and it is agreed that amount is an estimate of actual damage to the Owner which will accrue during the period in excess of the prescribed date of Completion.

(b) The Owner may deduct any amount under this paragraph from any monies that may be due or payable to the Contractor on any account whatsoever. The Liquidated Damages payable under this paragraph are in addition to and without prejudice to any other remedy, action or other alternatives that may be available to the Owner.

(c) The Contractor shall not be assessed with Liquidated Damages for any delay caused by a Force Majeure Event. If the Contractor is delayed by reason of alterations or changes made under Section GC 3.10 of the General Conditions, the time of Completion shall be extended as determined by the Contract Administrator in his or her sole discretion."

(b) Add a new GC 8.02.10 as follows:

"GC 8.02.10 Maintenance Security Holdback

.01 In addition to any other holdback required by Applicable Law or otherwise agreed by the Parties, the Owner will retain, until expiry of the Warranty Period, money in the amount calculated pursuant to paragraphs .02 and .03 hereof which money may be applied by the Owner in whole or in part in order to reimburse the Owner for losses, costs incurred or funds expended by the Owner as a result of default by the Contractor respecting the warranty obligations of the Contractor set out in the Contract ("**Maintenance Security Holdback**").

.02 The Maintenance Security Holdback shall be first retained by the Owner when the Contract Administrator certifies that Work to the value of 70% of the Contract Price has been performed and shall be calculated and shown as an amount to be retained in the monthly applications for payment by the Contractor in succeeding applications, commencing when the Contractor makes his first application for payment on the basis that Work to the value of 70% of the Contract Price has been performed.

.03 A Maintenance Security Holdback will be calculated in accordance with the following Table:

Contract Value	Amount of Maintenance Security Holdback
less than $300,000	4% of Contract value
$300,000 - 800,000	$20,000
$800,000 - 1,500,000	$30,000
greater than $1,500,000	2% of Contract value

.04 The Maintenance Security Holdback is in addition to any other rights or remedies of the Owner in respect to the correction of the Contractor's default of the Contractor's warranty obligations.

.05 Some portions of the Work have an extended warranty. A proportionate amount of the Maintenance Security Holdback will be retained until expiry of the extended portions."

1. GENERAL

1.1 DESCRIPTION OF WORK

The Work of the Contract includes:

Roadway grading and surface works, reconstruction and addition of new sanitary sewers, storm sewers and watermains along Van Horne Avenue and Claybanks Road, installation of a new sanitary lift station and installation of a new roundabout at the Van Horne Avenue & Claybanks intersection.

The description of the Work stated above is not, nor is it intended to be, a complete and all-inclusive "Description of Work".

The Work under this Contract includes the following on various streets:

- Milling or stripping existing asphalt pavements;
- Placing of HL4 asphalt;
- Excavation
- Granular A and B;
- Topsoil and Seed
- Removal of concrete sidewalks and curb and gutter;
- Concrete sidewalks and curb and gutter;
- Watermains and appurtenances;
- Cathodic protection of watermains;
- Sanitary and storm sewers and appurtenances;
- Sanitary lift station and forcemain
- Pavement markings and Roadway Small Signs
- Rip-Rap and Geotextile
- Subdrains

1.2 LIMITS OF CONTRACT

The limits, of the Contract, are the limits of the property and/or road allowances in which the work is to be performed or is otherwise shown on the drawings.

1.3 FUTURE WORK

The Contract has been designed for future additions where shown. Ensure the Work of this Contract avoids encroachment into areas shown for future additions.

Where capped services, empty conduit, empty outlet boxes and similar items are shown for future extension, clearly identify and record the terminations for ready access for future use. Where such terminations are concealed, accurately dimension their location

on "as-built" drawings. Equip capped piping, other than drain and vent, with a shutoff valve whether shown on the drawing or not.

1.4 PRECONSTRUCTION MEETING

(A) Following award of the Contract and the instruction to commence the Work, the Contract Administrator will convene a preconstruction meeting with the Owner's representative, the Consultant and the Contractor, and affected utilities.

(B) The meeting agenda will include:

1. the appointment and notification of official representatives of participants in the Work;
2. requirements for temporary facilities, site signs, offices, storage sheds, utilities, hoarding, site access and use;
3. Health and Safety issues;
4. site security;
5. the Work schedule, including the Products delivery schedule;
6. a schedule for submission of shop drawings, samples and similar documents;
7. a schedule for site meetings;
8. a review of administrative procedures, including change notices, change orders, site instructions, record drawings, maintenance manuals, takeover procedures, progress claims;
9. the appointment of inspection and testing agencies or firms; and
10. other items as arise at the meeting.

(C) The Owner will arrange space and facilities for the meeting, and the Contract Administrator will document the responsibilities and necessary activities of the participants during construction as discussed and prepare and distribute minutes of the meeting to each attendee.

1.5 SITE MEETINGS

(A) Provide suitable accommodation in which to hold site meetings.

(B) Site meetings will be held on a regular schedule agreed to at the preconstruction meeting. The Owner, Consultant and Contractor will be in attendance. The purpose of these meetings is to discuss the progress of the Work and related matters including:

1. review and acceptance of previous meeting minutes;

2. field observations and any problems or conflicts;

3. any problem that may impede Work progress and the construction schedule and corrective measures required;

4. revisions to the construction schedule and the Products delivery schedule; and,

5. review of submittal schedules.

1.6 DAILY SITE PROGRESS RECORDS

(A) Maintain, at the site, a permanent written record of progress of the Work. Make the record available to the Consultant upon request and provide them with a copy if requested. Include in the record each day:

1. the weather conditions with maximum and minimum temperatures;

2. the conditions encountered during excavation;

3. the commencement and the completion dates of the Work of each trade in each area of the Contract;

4. the dates, the quantities, and the particulars of each concrete pour;

5. the numbers and classifications of the Contractor’s and the Subcontractor’s tradesmen working at the site and the numbers and classifications of construction machinery and equipment and the number of hours each is operated;

6. visits to the site by the Owner, the Consultant, the regulatory authorities, the testing companies, the subcontractors and the suppliers.

1.7 MONTHLY PROGRESS REPORTS

(A) The contractor is to prepare and submit monthly progress reports outlining the work completed to date.

1.8 WORK ADJACENT TO PUBLIC OR PRIVATE PROPERTY

Obtain written consent from the owner of adjacent property before proceeding with a part of the Work that necessitates entry onto such property for the underpinning of adjacent structures and where overswing of cranes may occur. Such written consent will not limit the Contractor's responsibility for property damage or personal injury.

1.9 CONTRACT ADMINISTRATOR'S SITE OFFICE

(A) Provide an insulated field office at the site for the exclusive use of the Contract Administrator. The office to include the following:

1. a minimum floor area of 18.5 m^2
2. vinyl floor tile;
3. four opening windows with insect screens;
4. a lockable door and screen door assembly;
5. a plan table of 1.4 m^2 min. area;
6. a drawing board of 1.4 m^2 min. area;
7. a desk and three chairs;
8. benches to seat a minimum of four persons;
9. a lockable, four-drawer, insulated, fire-resistant filing cabinet; (Note: An insulated filing cabinet is required to afford some protection of records against fire. If a 2-drawer cabinet is sufficient, edit accordingly.)
10. a storage rack for contract drawings and survey instruments;
11. a coat rack for a minimum of five coats;
12. a shop drawing storage rack or cabinet;
13. a notice board;
14. a private sanitary facility (toilet);
15. a first aid box as required by the Workers' Compensation Board for six to fifteen workers; and,

16. light the site office with fluorescent fixtures to a 650-lux (60 foot candle level) and automatically maintain a temperature between 21 and 25 degrees Celsius.

(B) Install the Contract Administrator's sign(s), supplied by the Contract Administrator, on the site where directed.

(C) Service, maintain and carry insurance on the site office and contents. Provide evidence of insurance to the Contract Administrator before Work commences.

1.10 ROADS AND TRAFFIC CONTROL

A traffic control plan (TCP) must be submitted to the Contract Administrator and approved prior to the start of construction.

When public thoroughfares are to be closed, or traffic restricted, notify the Road Authority, the Fire Department, the Police Department, the Transit Authority and Ambulance Service, giving at least seven days notice of the closing or restriction.

One lane of traffic must be maintained and passable at all times to ensure the residents of Claybanks Road have access to their properties.

Restrict normal traffic flow only with the consent of the Authorities having jurisdiction, and in accordance with their requirements.

When streets are scheduled to be closed in either direction for a duration exceeding 7 days, provide detour signage as per OTM Book 7. Submit detour plan to the Contract Administrator for review.

The contractor is to maintain a traffic sign diary that outlines the dates and locations of all traffic control signage implementation.

1.11 SANITATION FACILITIES

(A) Provide temporary sanitary facilities in accordance with the Occupational Health and Safety Act.

1.12 WATER SUPPLY

(A) Potable water from designated outlets may be used at no cost. Provide hoses as required. Backflow preventers will be supplied by the City at no cost to the Contractor. Record volume of water/loads taken on daily basis and report to City. Repair any damage caused during use of existing water outlets.

1.13 ELECTRICAL POWER

(A) Provide temporary electric power for all construction needs. Locate receptacles so power is available to any part of the work within reach of a 30 m extension cord. Provide power at temporary storage sheds and field offices. Provide extension cords as required.

1.19 TESTING AND QUALITY CONTROL

(A) Furnish to the Contract Administrator, when requested and consistent with progress of the Work, test results and mix designs specified in the Contract Documents or required by bylaws, statutes and regulations relating to the Work and the preservation of public health, including the following:

1. inspection and testing performed exclusively for the Contractor's convenience;

2. testing, adjusting and balancing of conveying systems, mechanical and electrical equipment and systems;

3. mill tests and certificates of compliance and;

4. tests for reinforcing steel unidentified by mill test reports.

(B) Unless otherwise noted, the Contract Administrator will select and the Owner will pay for the services of a testing agency or laboratory for tests that are required but not specified, other than tests required by bylaws, statutes and regulations applicable to the Work.

(C) Remove and replace Products indicated in inspection and test reports as failing to comply with the Contract Documents.

(D) Correct improper installation procedures reported in the inspection and test reports.

(E) Pay the costs for the re-inspection and testing of replaced work.

(F) It is not the responsibility of the inspection and testing agents to supervise, instruct in current methods, or accept or reject a part of the Work, but only to inspect, test and to report conditions.

(G) Notify the Contract Administrator and the appropriate inspection and testing agent not less than forty-eight hours prior to the commencement of the part of the Work to be inspected and tested.

(H) Ensure the presence of the authorized inspection and testing agent at the commencement of the part of the Work specified to be inspected or tested.

(I) Ensure the inspection and testing reports are issued promptly (normally within forty-eight (48) hours), and that the Contract Administrator is notified forthwith if the report indicates improper conditions or procedures.

(J) Cooperate with and provide facilities for the inspection and testing agents to perform their duties.

(K) Provide proper facilities for the storage of concrete specimens at correct temperature, free from vibration or damage in accordance with the instruction of the inspection and testing agent and the governing standard.

(L) Submit four copies of each laboratory test report, unless specified otherwise, each copy signed by a responsible officer of the inspection and testing laboratory. Each report is to include:

1. date of issue;
2. contract name and number;
3. name and address of inspection and testing company;
4. name and signature of inspector or tester;
5. date of inspection or test;
6. identification of the Product and Specification section covering inspected or tested Work;
7. location of the inspection or the location from which the tested Product was derived;
8. type of the inspection or test;
9. the remarks and observations on compliance with the Contract Documents.

(M) Correct defective work within the Contract Time; the performing of such work is not a cause for an extension of the Contract Time.

1.20 CODES AND STANDARDS

(A) In the case of a conflict or discrepancy between the Contract Documents and the governing standards, the more stringent requirements apply.

(B) Unless the edition number and date are specified, the reference to the manufacturers' and published codes, standards, and specifications are to the latest edition published by the issuing authority, current at the date of tender closing.

(C) Reference standards and specifications are quoted in this Specification to establish minimum standards. Work in quality exceeding these minimum standards conforms to the Contract.

(D) Where reference is made to a manufacturer's direction, instruction, or specification it is deemed to include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the Products pertinent to their use and their relationship to the Products with which they are incorporated.

(E) Where reference is made to regulatory authorities, it includes all authorities who have, within their constituted powers, the right to enforce the laws of the Place of Work.

1.22 LABOUR, PRODUCTS AND WORKMANSHIP

(A) Products, named in the Specifications or on the Drawings by manufacturer's name and model number, establish the size, quality and performance standards for the Work. In most cases, alternate manufacturers' Products are listed as acceptable for the named manufacturer's Product. Base the Tender Price on the named manufacturers Product or the Product of an alternate manufacturer. If no alternate manufacturers are listed, base the tender price on the named manufacturer's Product.

(B) The Work has been designed based on the named manufacturer's Product. If the tender price is based on an alternate, acceptable, manufacturer's Product, ensure the alternate, acceptable manufacturer's Product is equivalent in size, quality and performance to the named manufacturer's Product. Include in the tender price for any modifications to the Work necessary to accommodate the alternate, acceptable manufacturer's Product and submit for the Contract Administrator's review a dimensioned layout of the space into which such Product is to be installed.

(C) Give preference to the hiring of local workers, provided they are available and physically fit and qualified by training and experience to perform the Work. The foregoing does not apply to Superintendent, Timekeeper, Supervisor and construction equipment and machine operators, or until ten days after the commencement of the Work. Make available at all reasonable times for examination by the Owner, the labour rolls for the determination of the domicile of the workers.

1.23 SUBMITTALS

(A) Unless otherwise noted, make submittals to the Contract Administrator for review.

(B) Make submittals atleast 10 business days prior to cutoff for manufacturing and in an orderly sequence to avoid any delay in the Work. Failure to submit in ample time is not considered cause for an extension of Contract Time, and no claim for extension by reason of such default will be allowed.

(C) Do not proceed with Work affected by submittals until review is complete.

(D) The Contractor's responsibility for errors and omissions, for providing the specified Products and for the construction of the Work in accordance with the Contract Documents is not relieved or diminished in any way by the Contract Administrator's review of submittals.

1.24 SCHEDULES

(A) Within fourteen (14) days of the written notification of tender acceptance, submit for the Contract Administrator's review, the following schedules:

1. a construction schedule;

2. a submittal schedule for shop drawings and Product data sheets;

3. a submittal schedule for samples;

4. a Product delivery schedule and,

5. a cash flow schedule.

(B) Prepare each schedule in the form of a horizontal bar chart, with a separate bar for each trade or operation, and a time scale identifying the first work day of each week.

i. the construction time shown on the initial schedule shall not extend beyond the specified Contract completion date. The construction schedule shall include all non-working periods and appropriate allowances for inclement weather.

ii. the Contractor shall select the activities so that the work is identifiable and the progress of each activity can be determined. At a minimum, each trade and operation shall be identified on the schedule. The City reserves the right to limit or increase the number of activities on the diagram.

iii. Each activity in the initial and updated construction schedules shall include a description of the operation and the number of days allocated or actually used for it. When the duration of an activity is dependent on weather conditions, the number of days allocated shall include an allowance for normal frequency of

inclement weather. When the activity has an associated tender item quantity, the approximate quantity shall also be shown.

iv. The construction schedule shall show the sequence and interdependence of all activities required to complete the work under the Contract. All network connections used to create a logical schedule and the corresponding durations shall be shown. The time scale of the construction schedule may be divided into days or weeks.

(C) Consult with the Contract Administrator during preparation of the schedules; make any corrections agreed to during the review period, and issue final copies to the Contract Administrator.

(D) Monthly, update each schedule during the course of construction and issue revised copies at each progress meeting.

(E) Prepare a two week forecast for work and update and submit to CA every week via email.

(F) If the progress of any part of the construction falls behind schedule, immediately notify the Contract Administrator in writing giving the reason for the delay and the action to be taken to regain the construction schedule to complete the Work at the Contract Time.

(G) The Contractor shall not be permitted to start work until the Contract Administrator receives a construction schedule, in conformance with the contract.

(H) If, for any reason, the Contractor cannot produce an acceptable construction schedule within 30 business days of initial submission of the construction schedule, the Contractor shall be in default of the contract.

1.25 SHOP DRAWINGS AND PRODUCT DATA

(A) Submit the shop drawings and Product data sheets as specified in sections of the Specification.

(B) Show on the shop drawings the Products, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for proper performance of the Work. Where Products attach or connect to other Products, indicate that such items have been coordinated, regardless of the Section under which the various products have been specified. Identify by cross reference to design drawings and Specifications.

(C) Product data sheets are defined as manufacturer’s catalogue sheets, brochures, literature, technical data, performance charts and diagrams and similar data used to

illustrate quality, characteristics, capacity and performance of the specified, manufactured Products.

(D) Submit electronically via email to the Contract Administrator.

(E) The Contract Administrator will review the shop drawings and Product data sheets and will indicate his review status by stamping shop drawings and product data sheets copies as follows:

1. "Reviewed" or "Reviewed as Noted" – If the Contract Administrator's review of a shop drawing or Product data sheet is final, the Consultant will stamp the shop drawing or Product data sheet "Reviewed" or "Reviewed as Noted" (appropriately marked) and keep his own required number of copies. The sepia or AutoCAD disk and one white print will be returned to the Contractor.

2. "Revise and Resubmit" – If the Contract Administrator's review of a shop drawing or Product data sheet is not final, the Contract Administrator will stamp the shop drawing or Product data sheet "Revise and Resubmit", mark the submission with his comments, keep one copy for his records, and return the sepia and a marked print to the Contractor. Revise the shop drawing or Product data sheet in accordance with the Contract Administrator's notations and resubmit.

(G) The shop drawings and the Product data sheet reviews do not authorize changes in cost or time. Changes involving cost or time are authorized only by a signed change order.

(H) It is understood that the following is to be read in conjunction with the wording on the Contract Administrator's shop drawing review stamp applied to each and every data sheet or drawing submitted:

"This review by the Contract Administrator is for the sole purpose of ascertaining general conformance with the Contract design concept. This review does not mean that the Contract Administrator approves the detail design inherent in the shop drawings, responsibility for which remains with the Contractor, and such review does not relieve the Contractor of the responsibility for errors or omissions in the shop drawing or of his responsibility for meeting all requirements of the Contract Documents. Be responsible for confirming and correlating dimensions at the Place of the Work, for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all subtrades."

1.26 SAMPLES

(A) Submit, in duplicate unless otherwise noted, samples as specified in Specification sections. Label samples as to origin and intended use in the Work.

(B) Deliver samples prepared to the Contract Administrator's business address or testing company as directed.

(C) Notify the Contract Administrator in writing, at the time of submission, of any deviations in samples from requirements of the Contract Documents and state the reason for such deviations.

(D) Adjustments made on samples by the Contract Administrator are not intended to change the Contract Price. If adjustments affect the value of the Work, state such in writing to the Contract Administrator prior to proceeding with the Work.

(E) Make changes in samples, which the Contract Administrator may require, consistent with the Contract Documents.

(F) Where changes or modifications of the Products for which samples are submitted are required, resubmit samples embodying the required changes or modifications.

(G) Where colour, pattern or texture is a criterion, submit a full range of samples.

(H) Reviewed samples will become the standard of workmanship and material against which the performed Work will be verified and accepted.

1.27 RECORD DRAWINGS

(A) When work begins at the site, obtain from the Contract Administrator a white print set of the Contract Drawings.

(B) Record on the white prints on a daily basis, work constructed differently than shown on the Contract Documents. Record all changes in the Work caused by site conditions, or originated by the City, the Contract Administrator, the Contractor, or a Subcontractor and by addenda, supplemental drawings, site instructions, supplementary instructions, change orders, correspondence, and directions of regulatory authorities. Accurately record the location of concealed mechanical services and electrical main feeders, junction boxes and pull boxes. Do not conceal critical Work until its location has been recorded. Do not use these drawings for daily working purposes and make the set available for periodic inspection by the Contract Administrator.

(C) Make records in a neat and legibly printed manner with a non-smudging medium.

(D) Dimension the installed locations of concealed service lines on the site or within the structure by reference from the centre line of the service to structure column

lines or other main finished faces or other structural points easily identified and located in the finished Work.

(E) Submit these record drawings to the Contract Administrator for review.

(F) Submit an as-built survey point file with GIS coordinates for all structures, including depths, sizes, names, descriptions, etc.

1.28 EQUIPMENT OPERATING AND MAINTENANCE INSTRUCTION MANUALS

(A) Submit a minimum of five (5) weeks prior to the application for a Certificate of Substantial Performance, five (5) copies of the operating and maintenance manuals for each item of equipment.

(B) Each manual is to contain operational information on equipment, cleaning and lubrication schedules, maintenance data, overhaul and adjustment schedules, parts list and similar maintenance information. Instructions are to be in simple language to guide the City in the proper operation and maintenance of the equipment.

(C) Bind each set of the contents in an identified three post, hard covered, plastic jacketed binder equal to Grand and Toy No. L21-P5436. Organize contents into applicable categories or work as per Specifications Sections, and use identified tabs or coloured index sheets to separate categories.

(D) Refer to other Divisions of the Specification for more specific requirements for the manual(s).

(E) In addition to information specified above or in other Divisions of the Specification, include the following in each binder:

1. a title sheet, labeled “EQUIPMENT OPERATING AND MAINTENANCE INSTRUCTIONS” containing the project title and submittal date;

2. a list of contents page;

3. the names and addresses of the Subcontractors and the Contractor’s name and address;

4. a complete list of the names, addresses and telephone numbers of firms and suppliers from whom parts may be purchased and who can effect repair or maintenance on equipment;

5. copies of warranties and guarantees;

6. copies of the hardware schedule and room finish schedule;

7. test reports for building systems;

8. copies of approvals, certificates and similar documents from governing authorities;

9. a final, reviewed copy of all shop drawings and Product data sheets;

10. a full description of building systems and operations;

11. a complete list of instructions and names of Products to be used for the cleaning of and the maintaining of finished building surfaces.

(F) If, during the Contract Administrator's review of the manuals, revisions are required, the manuals will be returned with details of the revisions required. Revise the manuals accordingly and resubmit them for further review.

(G) Submit the final operating and maintenance manuals to the Contract Administrator five weeks prior to the application for a Certificate of Substantial Performance.

(H) The submission of the "Equipment Operating and Maintenance Instruction" manual is a condition precedent to the certification of substantial performance.

1.29 MEASUREMENTS FOR PAYMENT

(A) Notify the Consultant sufficiently in advance of operations to allow required measurements for payment. Unless otherwise specified, measurements will be taken in the horizontal plane.

1.30 CASH ALLOWANCES

Item No.	**Description**	**Amount**
2.23	Pole Support	$5000.00
2.24	Utility Relocations (excavation only)	$25,000.00

(A) Expend the cash allowances only on the written direction of the Consultant.

(B) Submit to the Consultant detailed invoices for all work performed and paid for under the conditions of an allowance.

1.31 CUTTING AND PATCHING

(A) Remove and replace defective and non-conforming work.

(B) Where new work connects with existing work and where existing work is altered, cut, patch and make good to match existing work.

(C) Do all cutting with power saws or core drilling equipment. Do not use pneumatic or impact tools. Make all cuts with clean, true, smooth edges.

(D) Do not cut, bore or sleeve any load bearing structure without the written consent of the Contract Administrator, unless specifically detailed on the Drawings. Submit details with each request for consent.

(E) Provide openings in non-structural elements of the Work for penetrations of mechanical and electrical work. Coordinate size and location of such openings with the trade involved.

(F) Fit construction tightly to ducts, pipes, conduits and similar Products to stop air movement completely. Where such work penetrates a fire separation element or wall of the building, pack the penetration around the duct, pipe, conduit or similar for the length of the openings with ULC listed fire stopping packing Product as part of the Work specified.

(G) Prepare the surfaces to receive patching and finishing.

(H) Refinish the surfaces to match the adjacent finishes. For continuous surfaces refinish to the nearest intersection, and for an assembly, refinish the entire unit.

1.32 MANUFACTURER'S INSPECTION AND CERTIFICATION OF EQUIPMENT SYSTEMS

(A) Have a factory-trained service representative attend at the site to inspect installation of each item of equipment, to supervise equipment start-up and to instruct the City's plant operators in the proper operation and maintenance of the equipment.

(B) On completion of the installation, testing and start-up of each item of equipment, submit to the Contract Administrator, the manufacturer's certificate stating the installation of the equipment has been inspected, is installed in accordance with the instructions, has been started and adjusted as necessary, the City operators have been instructed in the operation and maintenance and it is a warranty condition.

1.33 DEMONSTRATIONS OF SYSTEMS

(A) Prior to issue by the Contract Administrator of a certificate of substantial performance, instruct the City's designated representatives in all aspects of the operation and maintenance of systems and equipment provided under the Contract.

(B) Use the Contract operation and maintenance instruction manuals as the basis for instruction.

(C) Obtain in writing from the Contract Administrator a list of the City's representatives to receive instructions.

(D) Arrange for the services at the site, for the length of time required, of qualified technicians and other manufacturers' representatives to instruct on specialized portions of the installation.

(E) Submit to the Contract Administrator at the time of request for issue of a certificate of substantial performance, a complete list of systems for which instructions were given, stating for each system:

1. the date instructions were given to the City's staff;

2. the duration of instruction period;

3. the names of persons instructed;

4. the other parties present (manufacturers' representatives, etc.).

1.34 OPERATING AND TESTING OF THE WORK

(A) Prior to the beginning of the operating period:

1. provide the oil, grease and other products necessary to put the equipment into operating condition as instructed by the equipment manufacturers. Fill tanks and bins once (excluding chemicals) with the products as specified or as instructed by the manufacturer; and,

2. provide five (5) copies of the equipment manufacturer's manuals, fully indexed, for the operating of and the maintaining of the equipment.

(B) When the City's staff has been instructed on the operating of and the maintaining of all items of equipment comprising the Work and as a condition of acceptance of the Work, start and operate the Work for a continuous period of not less than 7 days. The City will provide operating staff for this operating period. Have available on call 24 hours a day, supervisory personnel, mechanics, electricians and other tradesmen as necessary to attend to the correction of any operating difficulties encountered by the plant staff.

(C) If at the end of the required 7 day operating period the Work is not physically operating as designed, continue the operating period until the operating of the Work is satisfactory.

(D) The acceptance starting of the plant will be one of the conditions precedents to the certification of substantial performance of the Work.

1.35 WARRANTY INSPECTION

(A) The Contract Administrator will arrange and conduct with the City and the Contractor a warranty inspection at the site prior to expiration of the one year warranty period.

1.36 EXTENDED WARRANTIES

(A) Submit to the Contract Administrator prior to the issue of the certificate of substantial performance, extended warranties as listed below and as specified in applicable sections of the Specification.

(B) Extended warranties are to continue beyond the one year warranty period specified in the General Conditions and Supplementary Conditions.

(C) Submit each extended warranty in a uniform format in accordance with the sample form in D below. Extended warranties and durations are as follows:

Product or System	Extended Warranty Period
TRENCH SETTLEMENT	**2 YEARS**

(D) SAMPLE FORM FOR EXTENDED WARRANTY

EXTENDED WARRANTY TO THE
CITY OF DRYDEN

DATE: _____ 20 ____
(Date of Issue)

PROJECT _____
(Name and Address of Project as per Agreement)

CONTRACTOR: _____
(Name of Contractor)

WARRANTED WORK: _____
(Describe Product and/or Work Covered by Warranty)

Upon written notification from the City that the work described above is defective, we, the undersigned, being the Contractor for the Project, will promptly supply all labour and supply and install all materials required to repair or replace the defective work to the satisfaction of the City and at no cost to the City.

This Warrant will not apply to defects caused by the work of others, maltreatment of the warranted Work, negligence, or acts of God.

This warranty will remain in effect for a term of one (1) year from the date of expiry of the one (1) year warranty specified in the General Conditions and will be in accordance with requirements of the General Conditions.

This warranty will not cover defects in the Work caused by others, maltreatment of the Work, lack of proper maintenance or other negligence, or acts of God.

SIGNED: _____
(Signature of Authorized Signing Officer)

NAME AND TITLE: _____
(Name and Title of Authorized Signing Officer)

1.37 SIDEWALK ACCESSIBILITY

(A) Provide signage and barricades at locations of concrete sidewalk removal (traffic cones not acceptable).

(B) Signage to advise of sidewalk closure and direct pedestrians to other side.

(C) Provide temporary asphalt ramps at locations of curb ramps when top lift paving is deferred more than one week after base.

1.38 HOURS OF WORK

(A) All work shall be scheduled and carried out within sunrise and sunset and per the City of Dryden's Noise By-Law (2083-91) which can be found on the City's website., unless otherwise approved by the Contract Administrator.

(B) Work on Saturdays is permitted, but work on Sunday's will be at the discretion of the City. The client is to request permission to work Sunday's from the City.

(C) If work is expected beyond sunset times, the Contractor is to notify the CA as soon as possible.

1.39 RESTORATION OF WORK SITES

Meet interval milestones on cleanup of work sites as follows:

(A) Sidewalks

1) Restore driveway access 72 - 96 hours after pouring of concrete.
2) Complete landscaping within three (3) weeks of final concrete pour.

(B) Paving Projects

1) Apply base paving within two (2) weeks of final grading (subject to any curb and gutter work.

(C) Sewer and Water Projects

1) Provide suitable backfill and grading to allow property access within 24 hours after pipe installations.
2) No more than two (2) successive blocks under construction without curbing or final grading work underway.

(D) Regulatory Signs

1) At no point will open streets be left without proper regulatory signs (ie stop signs) in place.

Failure to meet interim cleanup schedules will result in the City stopping the workflow to other sites/blocks or otherwise calling a default on the work progress.

New construction streets shall not be commenced until final grading/base paving work is underway on existing locations.

1.44 CONTRACTOR COMMUNICATION

The successful Contractor must provide City Administration with a valid email account and phone number. It is expected that this email account is checked periodically and a reply will be received before the end of the following business day.

1. CONSTRUCTION

Unless otherwise indicated, all work covered in this specification shall be to the latest Ontario Provincial Standard Specifications.

In this Contract Special Provisions section, the Contract Administrator is referred to as the CA.

The Contractor shall be responsible for the supply, safe storage and handling of all materials set forth in this Specification.

All materials supplied under this Specification shall be subject to inspection and testing by the CA and/or by a Testing Laboratory designated by the CA.

All labour, equipment, and materials required to complete the work in accordance with the special provisions shall be included in the applicable Contract tender prices.

2. CONSTRUCTION LAYDOWN AREA

Additional environmental protection measures to be implemented in this area due to the proximity of the Laura Howe Marsh. Contractor to prepare an erosion control plan based on their intended use of the area and the plan is to be approved by the CA and City. The area is to be reinstated to existing or better conditions upon completion of the contract.

All mobilization and demobilization costs are to be included in Contract items. No separate payment will be made. Costs associated with the erosion control at the laydown area should also be included in contract items.

3. TEMPORARY ACCESS TO LAURA HOWE MARSH RECREATIONAL TRAILS

Construction shall be sequenced so that access to the Laura Howe Marsh is maintained at all times. If there is a need to temporarily restrict access, the CA and City shall be given at least 24 hours notice.

4. TEMPORARY CLOSURES

Construction to be sequenced so that access to driveways to be maintained at all times. Should a full restriction be required, the Contractor to notify the property owner a minimum of 24 hours prior to the closure. This includes access for fire and emergency vehicles over the duration of the Contract. Access to property shall be safe for pedestrian and vehicular traffic.

Traffic control for closures or work near roadways to follow the most current version of Ontario Traffic Manual – Book 7 Temporary Conditions and to be approved by the CA and City of Dryden prior to implementation. All labour, equipment, and materials required to facilitate any traffic control is at the Contractor’s expense, no additional compensation will be provided.

The Contractor shall plan and schedule the routes of vehicles transporting all materials to, from or within the job site, so that vehicular movements are accomplished with minimum interference and interruptions to traffic and the public.

5. SITE ACCESS

The Contractor shall familiarize themself with the location of the project and the access issues involved. Access shall be the responsibility of the Contractor including any approval, materials, and costs. Where access is needed on private property, the Contractor is responsible for contacting the property owner and obtaining written approval to enter their property prior to doing so. Any disturbance or damage as a result of access to any work location shall be repaired to equal or better condition at the cost of the Contractor.

Where work areas are not adjacent to an existing roadway, vegetation should be cleared to a minimum width to allow the smallest sized piece of equipment capable of completing the work. Any temporary access is to be removed upon completion of the work. The contractor is responsible for the installation and removal of all materials required to install and remove the temporary access where it is required.

6. DISPOSAL OF MATERIALS

Any excess materials should be reused in fill areas throughout the contract. If there is an overrun upon completion of the contract, this material will become the property of the Owner and is to remain on the City property at a location to be determined by the Owner.

Should excess material be removed from the contract limits and disposed of on property that is not owned by the City, it shall become the property and responsibility of the Contractor and shall be managed and disposed of off-site in accordance with OPSS MUNI 180.

All costs associated with the management of materials are deemed to be included in the Contract unit prices.

7. EQUIPMENT

The equipment used shall be capable of doing the work in accordance with the applicable specifications. The equipment shall be suited to the material being compacted, excavated, removed, graded and placed; to the degree required within the constraints of available space accordingly.

8. SITE CLEANLINESS

The Contractor shall clean existing surfaces where necessary, and as specified by the CA. The Contractor will provide mechanical sweeping equipment that may be required for this purpose.

9. EXCAVATION

During any excavation work, the Contractor shall be careful not to undermine existing pavement, sidewalks, and adjacent structures or damage existing utilities. All gas mains and connections, telephone and power cables, and other such items, shall be uncovered to such an extent that their locations are established in the field prior to excavating over or around them. The Contractor shall have a person directing the machine operator when Work is carried out adjacent to existing utilities, sewers, water mains, gas mains, pavement, sidewalks, structures, etc., to see that these items are not damaged.

10. NOTICE TO CONTRACTOR – PRESENCE OF UTILITIES

Overhead and underground utilities are located within the Contract Limits. The Contractor shall be responsible for any damages resulting from his operations. The Contractor is responsible for arranging utility locates (including on private property if required). The Contractor shall work around all poles, guy wires, and gas lines and shall exercise necessary care and precautions to safeguard these poles and gas lines from damages during grading operations. Earth excavation by mechanical or manual methods may be required around existing utilities. The Contractor shall utilize appropriately sized equipment to complete grading work while maintaining the minimum operating distances from overhead utilizes as identified in the Occupational Health and Safety Act Regulations for Construction Projects and all other applicable regulations. All costs for the required excavation and approvals shall be borne by the Contractor.

All utilities shall be located prior to construction activities beginning.

In addition to completing the required locates via Ontario One Call, the Contractor shall contact the following, but not limited to, utility companies:

- Hydro One
- Bell Canada
- Enbridge Gas
- Shaw Cable
- TBayTel

Coordination with utility companies who will be upgrading, adding or modifying their equipment within the project limits shall be completed prior to construction and a schedule put into place to ensure there is no conflict between the general contract work and any work being completed by a utility company.

11. WORK ADJACENT TO HYDRO ONE AND ENBRIDGE GAS EQUIPMENT

The contractor is responsible for obtaining any permitting and/or permissions related to work completed in proximity to Hydro One and Enbridge Gas equipment. All required clearances must be maintained between equipment and utility property. This is to be completed at no cost to the City.

12. UTILITY RELOCATIONS

The contractor is responsible for coordinating all potential relocations with the appropriate utility companies within the contract. The contract scheduling should reflect the appropriate timeframes for the utilities to complete any work that is required.

Work completed under the cash allowance for utility relocations should be approved by the City or CA prior to the start of this work.

13. TEMPORARY EROSION AND SEDIMENT CONTROL

The temporary erosion and sediment control plan to be implemented prior to the commencement of any construction activities. Upon completion of the work, all temporary measures to be removed to the satisfaction of the CA.

14. DEWATERING

The contractor is responsible for submitting a dewatering plan prior to construction commencement. The plan is to be reviewed and approved by the Engineer and to meet all applicable OPSS's. The contractor is responsible for all the costs associated with dewatering activities.

15. HOURS AND LIMITATIONS OF WORK

Work shall be completed and scheduled to minimize the disruption to nearby property owners per the following conditions:

Noise Sensitive Area Limits	
The Entire Contract Area	
Constraint	**Constraint Details**
Equipment Maintenance	Equipment shall be maintained in an operating condition that prevents unnecessary noise, including but not limited to no-defective muffler systems, properly secured components, and the lubrication of moving parts.
Equipment Operation	Idling of equipment shall be restricted to the minimum necessary to perform the specified work.
Notification/Coordination with Business Owners	Contractor to provide advance notice and coordinate access closures. All work to be completed continuously and backfilled by end of day to ensure access. All efforts to be made by Contractor to limit disruption of business activities.

Hours of Work	Contractor's hours of work should be in accordance with the City of Dryden's Noise By-Law (2083-91) which can be found on the City's website.

16. LAYOUT

The CA will provide reference and quality assurance layout only. The Contractor is responsible for all layouts and staking. In the event the CA is not available, the Contractor shall have an experienced surveyor and suitable survey equipment to control vertical and horizontal alignment for the construction and quantity verification, as required.

The Contractor is responsible for construction the product to the final line and grade as specified elsewhere in the Contract Documents. All labor, equipment, and materials required to establish, set and maintain horizontal and vertical survey layout shall be included in the bid price of the Contract.

17. EQUIPMENT

The Contractor shall limit the use of equipment in areas not being reconstructed in order to avoid damaging surrounding features. The equipment shall be in good working order. Refuelling and maintenance of any equipment shall not be done near any ditches or drainage areas to protect the quality of water.

18. WEIGHTS AND MEASURES ACT

Weighing of materials used as part of the Work shall be the responsibility of the Contractor in accordance with the Weights and Measures Act and in accordance with OPSS 102 October 1992.

19. CONTRACTOR RESPONSIBLE FOR COMPACTION AND DUST CONTROL

The Contractor is responsible for the compaction of Granular materials and shall conform to OPSS MUNI 501, November 2017.

Method A as described in subsection 501.08.02 shall be used to determine the acceptability of compaction. Target densities and optimum moisture content shall be based on laboratory testing of a five point standard proctor test.

OPSS Appendix 501-B form shall be used for recording compaction results.

Water shall be used for compaction and dust control and shall conform to OPSS MUNI 506, November 2017.

The Contract shall take such steps as may be necessary to prevent dust nuisance resulting from his operations.

Where the work requires the sawing of asphalt or the sawing or grinding of concrete, blades and grinders of the wet type shall be used together with sufficient water to prevent the incidence of dust where dust would affect traffic or wherever dust would be a nuisance to residents of the area where the work is be carried out.

Water, calcium chloride flake or calcium chloride solution may be used for dust suppression and shall conform to OPSS MUNI 506, November 2017 and is restricted to vehicle right-of-ways. More frequent applications of water in close proximity to watercourses is preferred.

Basis of Payment for Dust Suppression and Water Compaction

Section 506.10.01 Water for Dust Suppression of OPSS MUNI 506, November 2017 and subsection 501.10.01 Compaction of OPSS MUNI 501, November 2017 are deleted in their entirety and replaced by the following:

Payment for all labour, equipment and materials to do the work for dust control and water for compaction shall be included in the applicable tender item(s).

20. QUALITY ASSURANCE

The Owner reserves the right to request Quality Assurance verification inspection and testing on all workmanship and materials should the Contractor's Quality Control testing show results that do not meet specifications. All costs for this QA testing are by the Contractor but are to be arranged by the CA. Substandard workmanship and materials shall be removed or repaired by the Contractor to the satisfaction of the CA at no additional cost the Owner.

21. CARRY-OVER WORK

Should any asphalt placement for trench restoration require carryover into 2027 as a result of asphalt plant closures, cold mix asphalt will be acceptable as a temporary reinstatement only if approved by the City of Dryden and the CA. The contractor will be responsible for all maintenance, repairs of the road and associated costs where these trench reinstatements are located through the winter until the paving can be completed per the contract documents. It is recommended that the Contractor begin with work that involves paving restoration to ensure that the paving will be completed while asphalt is available.

22. PAYMENT CERTIFICATES

The contract tender form has been split into two sections, above ground and underground. There is the potential for two separate payment certificates and will be confirmed at the time of contract signing.

1. INTENT

The Section covers the work for environmental protection, including the management and disposal of excess materials, control of water in dewatering, temporary erosion control measures, and the use of explosives.

2. EXECUTION

2.1 MANAGEMENT AND DISPOSAL OF EXCESS MATERIALS

OPSS 180

2.2 ENVIRONMENTAL PROTECTION FOR CONSTRUCTION IN WATERBODIES AND ON WATERBODY BANKS

OPSS 182

2.3 DEWATERING OF PIPELINE, UTILITY AND ASSOCIATED STRUCTURE EXCAVATION

OPSS 517

Prior to doing any work on the shoreline or in the water body, the Contractor must first apply for and receive a work permit from the Ministry of Natural Resources.

2.4 CONTROL OF WATER FROM DEWATERING OPERATIONS

OPSS 518

2.5 TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES

OPSS 805, except the following:

i. The City reserves the right to require the Contractor to provide a formal temporary erosion and sediment control plan prior to the commencement of construction.
ii. All temporary erosion and sediment control measures shall be installed prior to the commencement of construction.
iii. Catch basin sediment control devices to be installed at all catch basins within construction area. Additional catch basin sediment control devices may be required at catch basin locations downstream from construction zone as directed by the Contract Administrator.
iv. The following OPSD's are referenced as applicable for temporary erosion and sediment control measures: 219.110 (Light Duty Silt Fence Barrier), 219.130 (Heavy Duty Silt Fence Barrier), 219.180 (Straw Bale Flow Check Dam),

219.210 (Rock Flow Check Dam V-Ditch), and 219.211 (Rock Flow Check Dam Flat Bottom Ditch).

v. Payment for these works, including sediment removal, installation, inspection, maintenance, and removal of these works shall be included in the tendered prices for items in the Contract which require the temporary works.

OPSS 805, except that payment for these works shall be included in the tendered prices for items in the Contract, which require the temporary works.

2.6 USE OF EXPLOSIVES

OPSS 120

2.7 SITE WORKING AREAS

Confine operations to limits of the site working area shown on Drawings.

Provide access roads to the site working area and on the site in locations shown or otherwise acceptable to the Contract Administrator.

Install fencing, suitable to the Engineer, to clearly define the working limits to the site working area, haul routes, parking areas, access routes and maintenance areas to ensure all activity is confined to these areas.

Provide interim site drainage for street under construction. Take responsibility for erosion that occurs during construction operations.

2.8 REFUELING

Carry out all equipment maintenance and refuelling out so as to prevent the entry of petroleum products into the ground or watercourses at all times.

2.9 NOISE EMISSIONS

Control noise emission from equipment and plant to local authorities' noise emission requirements.

2.10 DUST CONTROL

Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

2.11 ARCHAEOLOGY

During the performance of the work, have regard to the requirements of the Ontario Heritage Act, RSO 1980, Chapter59, and the Cemeteries Act; RSO 1980, Chapter 337.

If any archaeological and historical resources are discovered during the performance of the work, the performance of the work in the area of the discovery is to halt. Notify the Ministry of Citizenship, Culture and Recreation, Archaeology & Heritage Planning Branch, for an assessment of the discovery. Do not resume work in the area of the discovery until cleared to do so by the Ministry.

2.12 SITE RESTORATION

In general, restore the site to conditions equal to or, if specified elsewhere, to a condition better than existing conditions.

Restore lands outside of the limits of the Work, which are disturbed by the Work to their original condition.

2.13 SPILLS REPORTING

In the event of a spill or other emission of a pollutant into the natural environment, every person responsible for the emission of who causes or permits it must forthwith notify:

a) the Ministry of Environment (Tel. 1-800-268-6060);

b) the municipality or the regional municipality within the boundaries of which the spill occurred;

c) the owner of the pollutant, if known;
d) the person having control of the pollutant, if known; and

e) the Contract Administrator of the spill, of the circumstances thereof, and of the action taken or intended to be taken with respect thereto.

2.14 CONTINGENCY PLAN

Prior to commencing construction, prepare a contingency plan for the control and clean up of a spill. Submit for the Contract Administrator’s review and the review of other responsible Parties a copy of the Contingency Plan and make appropriate changes to it based on review comments received. The plans shall be reviewed at the pre-construction meeting. The contingency plan shall include:

a) the names and the telephone numbers of the persons in the local municipalities to be notified forthwith of a spill;

b) the names and the telephone numbers of the representatives of the fire, the police and the health departments of the local municipalities who are responsible to respond to emergency situations;

c) the names and the telephone numbers of the companies experienced in the control and cleanup of hazardous materials that would be called upon in an emergency involving a spill;

d) the Contractor's proposal for the immediate containment and control of the spill, the cleanup procedures to be initiated immediately and any other action to be taken to mitigate the potential environmental damage while awaiting additional assistance; and

e) the name and the office and home telephone number of the Contractor's representative responsible for preparing, implementing, directing, and supervising the contingency plan.

2.15 PROTECTION OF TREES

2.15.1 Definitions

Tree Protection Zone

The Tree Protection Zone shall be the area within the drip zone of any trees within or adjacent to the limits of the Contract, not designated for removal under the Contract.

The minimum Tree Protection Zone will be the area within a 3.0 m radius of the centre of a tree.

2.15.2 Protection Required with Tree Protection Zones

(i) Protect tree zone with snow fence or approved equal as per City of Thunder Bay Standard M-104-4.

(ii) In designated areas, install snow fence along the limits of the Protection Area.

(iii) Operate equipment to prevent damage to trees; do not permit heavy equipment to travel over Protection Areas.

(iv) Do not locate stockpiles, surplus excavated material, or construction materials within Protection Areas.

(v) Where construction operations must impact Protection Areas, prune the trees in advance. Cut roots with clean severances.

(vi) Excavations within Protection Areas shall be carried out using low impact methods such as vacuum excavation or directional drilling, unless otherwise specifically authorized by the Contract Administrator.

2.15.3 Tree Pruning (includes Root Pruning)

Preconstruction pruning shall be carried out by the City prior to starting the work. Contractor to provide minimum fourteen (14) days notice of work locations.

Where tree pruning is required and the contractor is authorized to carry out the pruning, the following specification applies:

Pruning – Comply with ANSI Specification A300

Pruning Guidelines:

- Prune to provide a vertical clearance of 4 m over streets, 2.5 m over sidewalks
- Temporarily tie back branches in lieu of pruning where practical
- Avoid pruning limbs greater than 10 cm in diameter, where practical, except for dead limbs
- Carry out pruning between late winter and early fall except for silver maple and white birch, which shall not be pruned until after the leaves are formed and American elm which shall not be pruned between April 1 and July 31

2.15.4 Damaged Trees

Notify the Contract Administrator of any damage to trees.

Provide remedial action to damaged trees using a qualified tree service

Submit the remedial program recommended by the tree service to the Contract Administrator, for approval, before carrying out the work.

If a tree is damaged beyond repair, replace the tree with two trees. The Contract Administrator will determine the species of the replacement trees.

Deciduous trees shall have a minimum diameter of 40 mm measured at a point 30 cm above the root ball or finished grade and be a minimum of 2 m in height. Coniferous trees shall be balled or wrapped in burlap and be a minimum of 1.8 m in height measured from the top of the root ball.

Plant and maintain trees in accordance with Section 02530.

2.16 SITE CLEARING AND PLANT PROTECTION

1. Protect trees and plants on site and adjacent properties where indicated.

2. Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping, and storage of materials over root zones.

3. Minimize stripping of topsoil and vegetation.

4. Restrict tree removal to areas indicated or designated by Contract Administrator.

1. INTENT

This section covers the work for the construction and /or rehabilitation of hot-mix asphalt, asphalt pavements, gravel pavements, sidewalks and walkways, curb and gutter, culverts, subdrains and other surface works.

1.1 RELATED WORK

Section 02520 – Excavation and Grading
Section 02530 – Landscaping
Section 02555 – Concrete Structures
Section 02570 – Excavation and Backfill of Trenches
Section 02575 – Storm and Sanitary Sewers
Section 02580 – Watermains
Section 02585 – Cathodic Protection of Watermains
Section 02590 – Storm and Sanitary Forcemains

1.2 INSPECTION AND TESTING

1.2.1 Responsibility for Testing

Provide samples of all materials for testing.

The Contractor shall arrange for testing of asphalt, granular materials and concrete. All testing will be carried out by certified testing laboratories. The cost of testing shall be by the Contractor.

1.2.2 Mix Designs

Prepare and submit mix designs for asphalt and concrete together with aggregate samples to the Contract Administrator for approval thirty (30) days in advance of commencing placing of these materials.

1.3 WEIGHING OF MATERIALS

OPSS 102

Provide electronic bar codes on each weigh bill conforming to ANSI MH10.8M-1983 for 3 of 9 bar code (Code 39).

Provide summaries of the weights of each type of material accepted at the site and separate summaries of rejected lands, on a daily basis.

1.4 SUBMITTALS

Prior to starting the work, documentation shall be submitted, verifying that the Contractor's representative of the concrete sidewalk and concrete curb and gutter placing

crew(s) shall be onsite for the duration of the work and shall have the Ready Mixed Concrete Association of Ontario (RMCAO) Municipal Exterior Flatwork Certification or American Concrete Institute (ACI) Flatwork Certification or an approved equivalent.

2. PRODUCTS

2.1 AGGREGATES

General – OPSS 1001
Concrete Aggregates – OPSS.MUNI 1002
Asphalt Aggregates – OPSS.MUNI 1003
Miscellaneous – OPSS.MUNI 1004
Granular Base, Subbase, Select Subgrade and Backfill Material – OPSS.MUNI 1010
5/8" Crushed Stone – OPSS.MUNI 1010 with the following gradation:

Sieve Size			**Percentage Passing by Weight**
	5/8"	(16.0 mm)	100
	1/2"	(13.2 mm)	75 – 95
	3/8"	(9.5 mm)	50 – 80
No.	4	(4.75 mm)	25 – 50
No.	16	(1.18 mm)	10 – 40
No.	50	(300 um)	2 – 20
No.	200	(75 um)	0 - 5

2.2 BITUMENS

2.2.1 Performance Graded Asphalt Cement – OPSS.MUNI 1101, PG 52-34

2.2.2 Liquid Asphalt – OPSS 1102

2.2.3 Emulsified Asphalt Primer:

Tack coat – OPSS 1103, SS1
Granular sealant – OPSS 1102, RC-30

2.2.4 Hot Mix Asphalt, HL3, HL4, HL8 - OPSS 1150
Recycled ratio – 20% maximum on base asphalt, 0% on top course

2.3 PERMANENT PAVEMENT MARKINGS

Polymer Pavement Markings OPSS 1714, or

Thermo Plastic Markings OPSS 1713, or

Stamark as supplied by 3M Canada or approved equal:

- 100 mm width, 270ES white, 271ES yellow.
- 600 mm width, 270ES white.
- Symbols Series SMS-L420.

2.4 HOT POURED RUBBERIZED ASPHALT, JOINT SEALING COMPOUND

OPSS 1212

2.5 PORTLAND CEMENT

OPSS 1301, Type 10

2.6 CONCRETE JOINT FILLER

OPSS 1308

2.7 CONCRETE CURING COMPOUND

OPSS 1315
White Pigmented Compound – Sealtight 1220 by W.R. Meadows, or approved equal.

2.7.1 CONCRETE PENETRATING SEALER

OPSS.MUNI 1350
Master Protect H 1000 by BASF Master Builders or approved equal

2.8 CONCRETE

OPSS.MUNI 1350
- minimum 32 MPa with 5-8% air entrainment
- exposure class C-2
- no chemical admixtures
- hot water to be used for concrete after October 15

2.9 CULVERTS

OPSS 1801
CSP aluminized coating; up to 300 mm, 1.6 mm thickness, greater than 300 mm, 2.0 mm thickness.
or

OPSS1840
HDPE CSA B182.8 smooth wall interior, corrugated exterior.
Minimum pipe stiffness 320kPA
Pipe joints to be Type 3 (external split coupler).

2.10 STEEL REINFORCING MESH FOR DRIVEWAYS

M.W.13.3 / M.W.13.3, 152 m x 152 m openings.

2.11 CALCIUM CHLORIDE

OPSS 2501

2.12 TACTILE PLATES
Unpainted cast iron, sizes various to suit ramp radius configuration. D&L Foundry or Neema or approved equal.

3. EXECUTION

3.1 RESTORING UNPAVED SURFACE

OPSS 301

3.2 PRIMING GRANULAR BASE

OPSS 302

3.3 GRANULAR SEALING

3.4 OPSS 305ASPHALT SIDEWALK, BOULEVARD OR DRIVEWAY

OPSS 311

3.5 HOT-MIX HOT-LAID ASPHALT CONCRETE – OPSS 310

Echelon paving is required on roads with four (4) or more through-lanes for top lift. Only one (1) cold longitudinal joint is permitted on top lift paving of City streets at road/crown center line.

3.6 PREPARATION FOR PAVING

OPSS 310

Patch holes and pad depressions, in existing asphalt by hand, grader or spreader prior to paving.

Place a tack coat strip 300 mm wide along all asphalt overlays, and under any feathered layer above existing asphalt where new asphalt thickness is less than 20 mm.

Where directed by the Contract Administrator, in lieu of a tack coat strip, mill a 1.5 metre wide strip (40 mm thickness) for making the joint at the beginning and end of asphalt overlays.

Place tack coat on vertical surfaces where top course asphalt abuts curbs or gutters, or the edge of existing asphalt.

Manholes to be reset 24 hours prior to paving. Maximum 6mm grade tolerance on final paving lift between manhole cover and final surface asphalt.

3.7 ASPHALT MILLING

Mill existing asphalt by the method of cold planing to the limits and depths as directed by the Contract Administrator. Asphalt milling to include cross fall correction where required.

Commence cleaning operations including mechanical sweeping and flushing to remove the milled asphalt from the road surface. Thoroughly clean the road surface before opening the road to traffic at the end of the day.

Provide ramping using sand mix asphalt at the locations of manholes, catch basins, water valves, and along the exposed milled edges for traffic movement and safety. Remove ramping prior to paving. No ramping is required if the milling, cleaning and re-paving operations are carried out in a continuous process.

Arrange for disposal sites for the milled asphalt.

Remove any loose asphalt chunks and winter sand that may remain on top of the gutters.

Maintain milled surface, including any break through areas, with hot mix patching if repaving is not continuous.

3.8 ASPHALT CURB & GUTTER

OPSS 312

3.9 GRANULAR BASE, SUBBASE, SURFACE AND SHOULDERS

OPSS 314
OPSS 501

3.10 HOT-IN-PLACE RECYCLED PAVEMENT

OPSS 332

3.11 GRANULAR SEALING, TACK COAT

OPSS 310

Tack coat final pavement lifts when carried over from previous years.

3.12 IN-PLACE PROCESSING OF BITUMINOUS PAVEMENT (PULVERIZING)

Pulverize the existing asphalt by the method of mechanical processing to the limits and depths as directed by the Contract Administrator. The standard depth of pulverizing requested will be 200 mm. Maximums up to 300 mm may be required subject to existing asphalt thickness.

Mix the pulverized material with the existing underlying granular base to a total depth of 150% of the pulverized depth.

Mix the pulverized material with new granular 'A' applied on top to a total depth of 150% of the granular 'A' lift.

All mixed material shall pass the 26.5 mm sieve and not more than 75% shall pass the 4.75 mm sieve.

Blade, shape and compact the surface to produce the specified grade and cross section to conform to the requirements of OPSS 301. Scarify and fine grade the surface immediately prior to paving.

Complete grading and compaction to the same station for the full pavement width prior to closing down operations each day.

Control dust, and grade the surface as directed by the Contract Administrator between completion of the pulverizing and final paving.

3.13 CULVERTS

OPSS 421
Install metal locate piece (U bolt) at ends of HDPE culverts.

3.14 SAWCUT ASPHALT JOINTS

Where directed by the Contract Administrator, saw cut the existing asphalt to provide a butt joint against the new pavement.

3.15 TRAFFIC LOOP DETECTORS

Traffic loop detectors may be encountered at signalized intersections where asphalt is to be milled or removed.

Arrange with the City Traffic Control and Street Lighting Division to adjust the traffic signals so that the loops can be disconnected prior to disturbance.

Arrange for the Traffic Control Division to replace loop detectors following milling or base paving and prior to top course paving.

3.16 PAVING ADJACENT TO MANHOLE AND CATCHBASIN FRAMES AND COVERS, AND VALVE BOXES

Paint all frames, covers and valve boxes with fuel oil prior to paving to prevent asphalt from bonding with metal surfaces.

3.17 SETTING MANHOLE AND CATCHBASIN FRAMES AND COVERS, AND VALVE BOXES TO GRADE

Set all manhole and catchbasin frames and covers, and valve boxes to grade prior to placing of the top course of asphalt.

3.18 ASPHALT RAMPING OF MANHOLE FRAMES AND COVERS, AND VALVE BOXES

Ramp manholes, valve chambers, and valve boxes, which project above the pavement with asphalt or cold mix to prevent damage to vehicles traveling on the street. If pavements are left low over the winter, set manhole covers and valve boxes to the base asphalt elevation. Adjust to final grade just before the final lift is laid.

3.19 CALCIUM CHLORIDE

Apply liquid or flake calcium chloride when directed by the Contract Administrator to reduce dust nuisance or to aid compaction.

Apply liquid calcium chloride solution at a rate of 7.2 tonnes per kilometer based on a 6.0 metre wide spray. The solution shall contain a minimum 35% by mass of pure calcium chloride.

Apply flake calcium chloride as directed.

3.20 WATER

Sprinkle the granular material with water during rolling, tamping and blading, when and if, directed by the Contract Administrator to aid compaction. Apply water uniformly immediately ahead of the compacting unit.

Apply water when directed by the Contract Administrator to reduce dust nuisance.

The Owner will supply the Contractor with water, from a designated hydrant nearest the job site, at no cost. Hydrant training and compliance with Water Use Permit will apply.

Apply to City of Dryden Waterworks Department prior to the start of construction to designate a hydrant in the area. Provide a 75 mm valve to control the water flow; do not control the flow with the hydrant valve. Install approved backflow preventer valve or provide air gap on truck fill piping.

3.21 ROUTING AND CRACK SEALING HOT-MIX PAVEMENTS

OPSS 341

3.22 CONCRETE SIDEWALKS

OPSS 351

Provide a firm schedule to the Contract Administrator for approval prior to commencing the work.

Schedule the placement of the concrete in such a manner that it follows very closely behind the excavation and backfilling procedure. Concrete placement shall not be closer than 20m of areas being prepared and compaction equipment used.

Apply curing compound in accordance with the manufacturer’s recommendations.

Replace any sections damaged by rain, traffic or other causes, prior to final acceptance of the work.

Trim or support hedges, bushes or other plants, which may be affected by the construction, as directed by the Contract Administrator. Cover any exposed roots with suitable fill immediately following excavation and/or provide root curtain.

Install tactile plates where specified. Some field cutting may be required. Protect surface from concrete spray over.

Apply concrete penetrating saline sealer to any sidewalk impacted by rain or freezing

temperature, cold weather work placement for scaling protection as directed by the Contract Administrator.

3.23 CONCRETE CURB AND GUTTER SYSTEMS

OPSS 353

When concrete curb and gutter is placed by the extrusion method, form contraction joints by saw cutting the hardened concrete within a sufficient time of placing of the curb and gutter to prevent uncontrolled cracking. Contraction joints may also be formed by the use of a "guillotine" knife in the wet concrete.

The width of the joint shall be 3 mm to 5 mm and the depth 65 mm minimum, at 6.0 metre maximum spacing.

When installing new catchbasin frames and covers in new sections of concrete curb and gutters, set the catchbasin frame in place at the same time the curb and gutter is placed. There will be no additional payment for resetting the catchbasin frame, if such is required.

When stripping exists on asphalt surface, new curb and curb repairs shall be completed prior to stripping asphalt.

Retain a minimum distance of 20m between any grading or compaction operations and the placement of new curb and gutter.

3.24 RECAPPING CONCRETE SIDEWALKS

Remove unstable surface to the depths as directed by the Contract Administrator.

Remove sod and excavate as necessary to install formwork.

Place wire mesh in driveways.

Place concrete in accordance with OPSS 351.

3.25 INTERLOCKING CONCRETE PAVERS

OPSS 355

3.26 SUBDRAINS

OPSS 405

3.27 BACKFILL BEHIND CURB

Backfill along the paved edge of the gutter with wet and solidly compacted Granular B fill and crushed gravel. Backfill behind curbs immediately after curing and prior to placing granular road base.

3.28 LINE AND GRADE – SIDEWALKS, CURBS AND GUTTERS

The Contract Administrator shall supply line and grade for the sidewalk construction.

3.29 RECONSTRUCTION OF EXISTING CONCRETE DRIVEWAYS AND PRIVATE SIDEWALKS

Reconstruct portions of the existing concrete driveways and private sidewalks as directed by the Contract Administrator. Provide a sidewalk or driveway equal to or better than the original construction except that in no case shall the thickness be less than 125 mm. Reinforced with M.W. 13.3/M.W. 13.3 wire, 152 mm x 152 mm, opening wire mesh. Reconstruction of private concrete sidewalks shall include the construction of steps, if required by the Contract Administrator.

3.30 ACCESS TO BUSINESSES & RESIDENCES

Maintain access to all businesses and residences where they abut the work area.

3.31 PAVEMENT MARKINGS

OPSS 710

3.32 RECONSTRUCTION OF ASPHALT DRIVEWAYS

Remove and reconstruct driveways as directed by the Contract Administrator. This reconstruction shall be equal to or better than the original construction. Supply and compact at least a 75 mm crushed gravel base and at least a 50 mm course of HL 3 or HL 4 asphalt. Where the existing driveways have driveway sealer, the Contractor shall supply and install one (1) coat of coal tar epoxy driveway sealer.

3.33 EXISTING SIGNS (NOT ALL THE EXISTING SIGNS ARE SHOWN ON THE DRAWINGS)

Where existing street signs, stop signs, traffic signs, etc. are to be relocated, remove the signs and, except for stop signs, place the signs on the boulevards out of the way of work so that they will not be damaged. Any stop sign, which has to be removed in order to carry out construction, shall be relocated in an alternate position by the Contractor as directed by the Contract Administrator. Such relocation of stop signs shall be done so as not to confuse or mislead motorists. The Contractor will be back charged for the cost of any missing or damaged signs upon completion of the work.

3.34 PARKING METERS

Remove and replace parking meter posts affected by the construction.

Contact the Parking Authority 48 hours in advance of any proposed removal of the meters.

3.35 ADJUST EXISTING MANHOLE FRAMES, CATCHBASIN FRAMES AND CURB AND VALVE BOXES

Adjust existing manhole and catchbasin frames and curb, and valve boxes to suit finished pavement grades.

Use precast concrete rings or modify masonry as necessary to adjust the grade at manhole and catchbasin frames.

If the existing item is replaced with a new frame and cover, or grate or valve box, the City will supply the replacement part at no cost to the Contractor. The Contractor shall pick up this replacement at the City yard.

4 MEASUREMENT FOR PAYMENT / BASIS OF PAYMENT

4.1 GENERAL

Payment for all items shall be full compensation for all labour, equipment and materials to complete the work.

4.2 HOT-IN-PLACE ASPHALT

OPSS 310, except that the Owner will be responsible for sampling and testing. Include the cost of ramping at manhole covers and valve boxes and the cost of coating of frames, covers, grates and valve boxes with diesel fuel in the unit price for this item.

4.3 RESTORING UNPAVED SURFACES

There shall be no separate payment for this item or for water for compaction of the restored surface. Include the cost for this item under Contract items for asphalt paving. Payment for additional materials shall be in accordance with OPSS 314.

4.4 TACK COAT

Include the cost for tack coat in the unit price bid for asphalt.

4.5 GRANULAR SEALING

OPSS 305.

Measurement for payment shall be based on the volume of bitumen placed, based on truck measurement.

4.6 ASPHALT IN SIDEWALKS, BOULEVARDS AND DRIVEWAYS

Measurement shall be based on the tonnes of asphalt placed. Payment for this item shall include the cost of the hot-mix asphalt.

4.7 ASPHALT CURB, CURB AND GUTTER

OPSS 312.

4.8 GRANULAR BASE, SUBBASE, SURFACE AND SHOULDERS

OPSS 314, except that payment for this item shall also include the application of water for compaction.

4.9 CULVERTS

OPSS 421

The unit price tendered shall also include the removal, disposal and replacement of existing culverts, including excavation and disposal of excess material.

The unit prices tendered shall include the cost of any bends, tees, couplings or aprons.

4.10 ADJUST EXISTING MANHOLE FRAMES AND COVERS, CATCHBASIN FRAMES AND GRATES, AND CURB STOP AND VALVE BOXES TO GRADE

The unit price for each of these items shall include the cost to excavate and adjust the item to its finished grade. No additional payment will be made due to the need to set an item at the interim grade, if top course paving is deferred over the winter.

Include the cost of readjusting curb and valve boxes before top course paving in the unit price bid for the new pavement.

4.11 ROUTING AND CRACK SEALING IN HOT-MIX PAVEMENTS

OPSS 341

4.12 CONCRETE SIDEWALKS

OPSS 351, except as follows.

The unit price bid for sidewalk and curb sidewalk shall include all costs of constructing or reconstructing sidewalk drops and entrance drops including tactile plates where required.

The City reserves the right to reduce progress payments up to 50% of the value of the tendered price for sidewalks dependent on the amount or restoration work that has been carried out on the section involved.

4.13 WATER AND CALCIUM CHLORIDE FOR COMPACTION AND DUST CONTROL

All water, required for compaction or dust control, shall be supplied by the Corporation, from a designated hydrant at no cost to the Contractor.

The unit price per tonne for calcium chloride flake shall include all costs to pick up the material from the City yard and to place the materials. There will be no cost charged to the Contractor by the City for the supply of this material.

The unit bid per tonne for liquid calcium chloride shall include all costs to supply, weigh and place liquid calcium chloride.

4.14 CONCRETE CURB AND GUTTER SYSTEMS

OPSS 353, except that no separate payment for granular base material will be made for curb or curb and gutter replacements.

4.15 INTERLOCKING CONCRETE PAVERS

OPSS 355

4.16 SUBDRAINS

OPSS 405

No separate payment will be made for excavation in earth, beyond the limits of road excavation or for the crushed stone backfill.

4.17 PAVEMENT MARKINGS

OPSS 710

4.18 RECAPPING CONCRETE SIDEWALKS

The unit price bid for this item shall be based on the placement of new concrete to a depth of 100 mm. If more or less concrete is placed, a price adjustment will be made, based on the unit price tendered for concrete - includes the cost of concrete bonding agent.

The unit price bid for this item shall include excavation, removal of sod or other work that is necessary in order to place the forms.

1. INTENT

This section covers excavation, grading, filling and compaction for roads, parking lots and adjacent areas.

1.1 RELATED WORK SPECIFIED ELSEWHERE

Related work specified elsewhere includes:

Section 02530 – Landscaping
Section 02570 – Excavation and Backfill of Trenches

2. PRODUCTS

Borrow Material – OPSS 212
Gabion Baskets – OPSS 1430
Rip Rap, Rock Protection, Sheeting – OPSS 511

Boulevard fill must be free of stones, boulders, debris, clay or granular material.

3. EXECUTION

3.1 CLEARING AND GRUBBING

OPSS 201, except that the Contractor shall be responsible for the disposal of trees.

3.2 EXCAVATION, FILLING AND GRADING

OPSS 206

3.3 BORROW

OPSS 212

3.4 EXCAVATION AND FILL – EXISTING BOULEVARDS

Remove all existing sod between the edge of the new sidewalk and the existing curb as directed by the Contract Administrator. Do not remove sod within the drip line of existing boulevard trees.

Removal of sod is to be paid for under the unit price tendered for excavation of sidewalks.

When directed by the Contract Administrator, dump and spread suitable excavated material on the boulevards. Remove boulders, stones, debris and other undesirable material. Spread and rake the fill as directed by the Contract Administrator. Spread and rake the fill on the boulevards before the surface course of asphalt is placed.

3.5 REMOVAL OF EXISTING CURBS, GUTTERS, DRIVEWAYS AND SIDEWALKS

Remove the lengths of curb, gutter, sidewalk and driveways as designated by the Contract Administrator. Dispose of all materials removed.

Saw cut the limits of the work prior to commencing the removal. Saw cutting of existing asphalt or concrete driveways should be done after the sidewalk is poured to determine proper grade. The Contractor shall cut driveways initially for rough grade for excavation and a second cut is required for final matching to grade.

Remove sidewalk foundation walls, if encountered. Ensure no damage to tree root system.

Root pruning and root curtains as specified.

3.6 GRADING BOULEVARDS

Slope boulevards to provide a uniform rising grade, 2% minimum, between the top of the curb or edge of shoulder and the property line.

3.7 PARKING METERS

Remove and replace parking meters as directed by the Contract Administrator.

Notify the Parking Authority 48 hours in advance of any proposed removal of parking meters, taken out of service. Provide sleeves where parking meters are to be installed in concrete pavements.

3.8 SALVAGE

Deliver old manhole and catch basin frames and covers and old culvert pipes, where not used in the Work to the City municipal yards. Where the existing culverts to be removed are in such a condition as to be reusable, exercise care in removing them.

4. MEASUREMENT FOR PAYMENT / BASIS OF PAYMENT

4.1 EXCAVATION, FILLING AND GRADING

Measurement for payment shall be by the cubic meter computed by:

a) the truck box volume measurements for each truck;

The Contract Administrator will calculate the volume of each truck box.

The Contract Administrator will make a field assessment on actual excavation payment volumes based on partial or complete filling of the truck boxes taking into account void spaces left and/or weight overload restrictions.

Include payment for the removal of sod in this Item.

4.1.1. Water

All water required for compaction or dust control shall be supplied by the Corporation from a designated hydrant. Unless specifically indicated in the Tender Form, the Contractor shall include the cost of using water for compaction or dust control in the unit cost of excavation or granular items.

4.2 RIP RAP, ROCK PROTECTION AND GRAVEL SHEETING

OPSS 511

4.3 INSTALLATION OF GABIONS

OPSS 512 except that the unit price bid will include the supply of geotextile material.

4.4 CLEARING AND GRUBBING

Payment for this Item shall include all costs of removal and disposal of trees and stumps and vegetation.

4.5 REMOVAL OF SIDEWALKS, CURBS AND GUTTERS

The unit price bid for these Items shall apply both to spot removals or removals of lengthy sections, based on those sections designated to be removed by the Contract Administrator.

No additional payment shall be made for the removal of foundation walls, if found beneath existing sidewalks.

4.6 BOULEVARD FILL

If suitable materials are available from excavation operations on site, the unit price bid for the excavation shall include the cost of placing, compacting and grading this material in the boulevards.

4.7 RELOCATION OF PARKING METERS, MAILBOXES AND/OR SIGNS

No additional payment will be made for this work.

4.8 DITCHING

Measurement for payment will be based on the actual length of ditching or re-ditching, measured along the ditch following the contour of the ground.

1. INTENT

This section covers the planting of seed, sod, trees and vegetation.

1.1 REFERENCES

Agriculture and Agri-Food Canada;
The Canadian System of Soil Classification, Third Edition, 1998.

Canadian Council of Ministers of the Environment;
PN1340-2005, Guidelines for Compost Quality.

U.S. Environmental Protection Agency (EPA)/Office of Water;
EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

City of Thunder Bay Parks Division Standards and Specifications

1.2 DEFINITIONS

Compost is a mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner. Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test. Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth (C:N ratio below 50, and contain no toxic or growth inhibiting contaminates). Composed bio-solids to: CCME Guidelines for Compost Quality, Category A.

Topsoil is a mixture of mineral particulates, microorganisms and organic matter, which provides suitable medium for supporting healthy plant growth.

1.3 SUBMITTALS

At the request of the Contract Administrator, the Contractor shall make available or submit Quality Control test results a minimum of seven (7) days prior to delivery of the material. When more than one source is used for supplying materials, test data from each source and product shall be managed independently.

2. PRODUCTS

2.1 TOPSOIL

OPSS 802

Topsoil shall contain no toxic elements or growth inhibiting materials and the consistency is friable when moist. The finished surface of topsoil shall be free from; debris and

stones over 50mm diameter, course vegetative material 10mm diameter and 100mm length occupying more than 2% of the soil volume, and couch or crabgrass rhizomes.

Topsoil shall meet the requirements of Table 1:

TABLE 1
TOPSOIL MATERIAL REQUIREMENTS:

	Minimum	Maximum
Sand [Note 1]	40%	65%
Silt [Note 1]	20%	40%
Clay [Note 1]	15%	25%
Organic Matter [Note 1]	5%	11%
pH	6.0	8.0
Available Nitrogen	20 mg/kg	40 mg/kg
Phosphorus	10 mg/kg	60 mg/kg
Potassium	75 mg/kg	250 mg/kg
Calcium, Magnesium, Sulfur, and micro-nutrients	Note 2	Note 2

Notes:
1. Soil texture based on The Canadian System of Soil Classification
2. Present in balanced ratios to support germination and/or establishment of intended vegetation.

The following topsoil amendments are permitted as required to achieve the minimum requirements set out in Table 1:

i. Fertilizer may be added as required. Fertilizer containing phosphorus shall only be applied subsurface, when seeding or sodding, by mixing it into the top layer of topsoil.

ii. Organic matter: compost Category A in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

Compost Category B may be used for landfill reclamation and large scale industrial applications.

iii. Peat Moss:
- Derived from partially decomposed species of Sphagnum Mosses
- Elastic and homogeneous, brown in colour
- Free of wood and deleterious material, which could prohibit growth
- Shredded particle minimum size: 5 mm

iv. Manure:
- Well-rotted and aged a minimum of three (3) years
- May be sheep or steer manure

v. Mushroom Compost

vi. Sand: washed coarse silica sand, medium to course textured

vii. Limestone:
- Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%
- Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve

viii. Bone Meal:
- Finely ground with a minimum analysis of 20% phosphoric acid

The Contractor shall be responsible for all Quality Control sampling and testing required to show complete conformance of the topsoil with this specification. These records shall be made available to the Contract Administrator upon request. The City reserves the right to further test the material. Failed QA tests will be charged to the Contractor.

Testing shall be conducted by a qualified laboratory holding a valid certificate from Ontario Ministry of Agriculture and Food (OMAFRA) and/or Canadian Association for Laboratory Accreditation (CALA).

Quality Control test results shall indicate conformance with pH, Organic Matter, Available Nitrogen, Phosphate, and Potassium parameters listed in Table 1.

2.2 SEED AND COVER

OPSS 804 (Except that seed mix for boulevard areas shall be 15% Kentucky Blue Grass, 20% Perennial Rye, 65% Creeping Red Fescue with an application rate of 225 kg/ha. Fertilizer shall be 8-32-16 with an application rate of 10 kg/100 sq.m and applied subsurface.)

2.3 SOD

OPSS 803 (Except that fertilizer shall be 8-32-16 with an application rate of 10 kg/ 100 sq.m and applied subsurface.)

2.4 TREES

Trees shall be Nursery grown, first grade (Number 1) stock and meet specifications of the latest edition of the Canadian Standards for Nursery Stock. Trees will be proven

hardy to Canadian Plant Hardiness Zone 3A or 3B or better. Trees shall be of the species and size indicated in the Contract. Depending on species, the minimum caliper will be either 50 mm or 60 mm, measured 300 mm above final grade, with heights of 2,500 to 3,400 mm.

2.5 GREEN INFRASTRUCTURE MATERIAL

Shredded hardwood bark mulch, river stone, engineered soil mix, pea gravel (washed), clear stone (washed) and top soil shall be supplied following specifications on contract drawings.

3. EXECUTION

3.1 PLACING OF TOPSOIL

OPSS 802

Depth: 100 mm

3.2 SEED AND COVER

OPSS 804

Top dress, fertilize, and over seed all sparse areas to obtain substantial growth throughout the warranty period.

3.3 PLACING OF SOD

OPSS 803; stake sod on slopes greater than 3:1.

On streets where there are existing sidewalks, remove all existing sod between the sidewalk and the new curb and gutter except within the tree protection zone of existing boulevard trees or as directed by Contract Administrator. Only top dress and seed within tree protection zone; re-grade the area in order to place new sodding. In areas where no sidewalks exist remove as directed by the Contract Administrator.

Sod shall not be installed on boulevards until driveways are fully restored.

If the thirty (30) day maintenance period extends after October 15th, the portion of the period after October 15th will continue the following year after May 15th.

3.4 PLANTING OF TREES

As per City of Thunder Bay Parks Division Standards and Specifications.

Warranty trees for two years from the date of planting. Replace non healthy trees during the warranty period. Prune dead or broken branches at the end of the warranty period as directed by Contract Administrator.

3.5 PLANTING OF SHRUBS AND PLANTS

Warranty shrubs and plants for two (2) years from the date of planting. Replace non-healthy shrubs and plants during warranty period.

4. MEASUREMENT FOR PAYMENT / BASIS OF PAYMENT

4.1 TOPSOIL

Where indicated separately on the Tender Form the measurement for the Topsoil item shall be by volume in cubic metres of topsoil imported and placed.

Payment at the Contract price for the above tender item shall be full compensation for all the labour, equipment, and material to do the work.

4.2 SEED AND COVER

OPSS 804, except that the unit price bid for this Item shall include fine grading and the supply and placing of topsoil as specified in the contract drawings.

Payment at the Contract price for the above tender item shall be full compensation for all the labour, equipment, and material to do the work.

The City will not pay for restoration as a result of areas damaged by the Contractor beyond the original limits identified in the field and on the contract drawings.

4.3 SOD

OPSS 802, except that the unit price bid for this Item shall include fine grading and the supply and placing of topsoil.

Payment at the Contract price for the above tender item shall be full compensation for all the labour, equipment, and material to do the work.

Measurements shall be taken of the area of sod placed upon completion of the work.

The City will not pay for sod restoration as a result of areas damaged by the Contractor beyond the original sod limits identified in the field and on the contract drawings.

4.4 TREES

The unit price bid per tree shall include excavation, supply and placing of planting, supply and placement of required soil volume after excavation, fertilizing, watering,

staking, pruning, mulching, dead wood pruning, water bag, rodent guard and requirements of the applicable OPSS.

4.5 PLANT, SHRUBS AND TREES

The unit bid price shall be lump sum and include excavation, supply and placing of plantings, supply and placement of required soil volume, fertilizing, watering and requirements of the City of Thunder Bay Parks Division Standards and Specifications.

Payment will be made in full upon complete installation of all trees, plants and shrubs, as accepted by the Contract Administrator.

4.6 ENGINEERED SOIL MIX, PEA GRAVEL, CLEAR STONE

Where used for landscaping, measurement for payment shall be based on the tonnes of material placed.

1. INTENT

This section covers the construction of small concrete structures including head walls, retaining walls, cast-in-place manholes and catchbasins, concrete bases and thrust blocks.

1.1 RELATED WORK SPECIFIED ELSEWHERE

Embedded Work in Structures for Electrical Systems – OPSS 913
Sign Support Structures – OPSS 915

2. PRODUCTS

Granular Material for Backfilling and Bedding – OPSS 902
19 mm Clear Stone – OPSS 1004
Concrete – OPSS 1350
Portland Cement – OPSS 1301
Steel Reinforcement – OPSS 1440
Precast Concrete Structures – OPSS 1351
Concrete Steps – OPSS 352

3. EXECUTION

Excavation and Backfilling – OPSS 902
Concrete Work – OPSS 904
Reinforcing Steel – OPSS 905
Formwork and Falsework – OPSS 919

4. BASIS OF PAYMENT/MEASUREMENT FOR PAYMENT

The price tendered for each structure shall include all labour, materials and equipment to complete the work including drain holes and sleeves.

Measurement for payment for manholes and catchbasins shall be per structure (each).

Measurement for payment for retaining walls shall be based on the volume of concrete placed, based on plan measurement.

No additional payment shall be made for earth excavation, granular backfill or reinforcing steel.

1. INTENT

This section covers excavation and backfilling of trenches for the installation of underground utilities, culverts and subdrains.

1.1 RELATED WORK SPECIFIED ELSEWHERE

Section 02510 – Roads, Sidewalks and Appurtenances
Section 02530 – Landscaping

2. PRODUCTS

Bedding - Compactable granular material with no stones larger than 25 mm
Crushed Stone – 100% passing a 25 mm sieve, 100% retained on a No. 4 sieve
Granular Materials – Granular A and B, OPSS 1010
Hot-Mix Asphalt – OPSS 1150
Wire Mesh Reinforcing – M.W.13.3 x M.W.13.3, wire; 152 mm x 152 mm openings
Concrete – OPSS 1350

3. EXECUTION

3.1 EXCAVATION AND BACKFILL

OPSS 401

When existing soils, undisturbed by the Contractor, are considered, by the Contract Administrator to be unstable, the Contract Administrator may order the unsuitable material to be excavated and backfilled with crushed stone.

3.2 EXCAVATION MAY BE STOPPED

The Contract Administrator may stop the excavation and any portion of the work and require the Contractor to complete the pipe laying and backfilling up to such point as he may direct, before excavation proceeds further. The Contractor shall not be entitled to receive any allowance or compensation, other than an extension of the time of completion for as many days as the Contract Administrator may determine.

If work is stopped on the whole, or any part of a trench, and the trench is left open for any unreasonable length of time in advance of the construction of the sewer, the Contractor shall, when directed by the Contract Administrator, refill such trench or part thereof, and temporarily repave over the same, at his own cost and expense, and shall not again open such trench, or part thereof, until he is ready to proceed with the construction of the sewer. If the Contractor refuses to completely refill such trench and temporarily repave over same within 48 hours after the receipt of Notice in writing to do so, the

Contract Administrator may refill and temporarily repave such trench, and the cost and expense thereof shall be charged to the Contractor.

3.3 MATERIAL TO BE EXCAVATED

Excavation shall include top soil, organic silt, peat, muskeg, clay, shale, hardpan, and all vegetation, debris, junk, brick, gravel, concrete, asphalt pavement, loose or disintegrated rock, stone or boulders 1 cubic metre or less in volume and other material encountered within the excavated limits.

Clear and grub the surface wherever necessary. Remove all excess material of whatever nature or kind. Separate the excavated material so that no broken pavement, curbs, sidewalk, boulders or other objectionable material is present in the material to be as backfill.

3.4 DISPOSAL OF EXCAVATED MATERIAL

Excess materials shall be managed following OPSS 180, and Section 01561 – Environmental Specification.

Where possible, do not place excavated material on the traveled portion of streets, access to lots, lawns, walks, driveways, etc. Cast material to one side of the trench only, unless otherwise directed.

The Contract Administrator shall be the sole judge as to the amount of excavated material, which can be stockpiled alongside the trench, and may order any or all of the excavated material removed and stockpiled.

3.5 DEWATERING

Comply with OPSS 517.

Provide sufficient pumping equipment. Do not allow water to run through the newly laid pipe.

The City is not responsible for additional costs incurred by the Contractor due to leakage from existing services or utilities.

3.6 MAINTAINING FLOW IN DRAINS

Provide for and maintain the flow, where required, of all sewers, drains, ditches and gutters, house or inlet connections, and all watercourses. Do not allow the contents of any sewer, drain, house or inlet connection or watercourse to flow into the trench or the sewers to be constructed under this Contract, except where permission is given by the Contract Administrator. Remove all offensive matter from proximity of the work, using such precaution in so doing as may be directed by the Contract Administrator.

3.7 RELOCATION OR REBUILDING OF UTILITIES

Should any utility be so situated or in such condition as in the opinion of the Contract Administrator, to require its removal, realignment or reconstruction, strip, uncover, support or sustain the structure requiring removal. The work or removal, realignment or change shall be done without cost to the Contractor. There shall be no compensation for delays incurred due to the removal, realignment or change of any utility.

The Contractor shall uncover and expose other utilities in advance of the proposed new work that may require relocation.

3.8 LOWER EXISTING WATERMAINS

Provide all necessary fittings, tie rods, thrust blocks and cathodic protection. Provide 48 hours' notice prior to proceeding with the work.

3.9 RE-LAY EXISTING SANITARY SEWER AND WATER SERVICES

Where the installation of the new sewer is in conflict with existing water and sewer service connections, re-lay the service connection as directed by the Contract Administrator.

3.10 BEDDING

Bedding types are shown on the drawings.

The type of bedding for concrete pipe shall be Class C. The method of bedding for all other pipes shall be Class B.

3.11 EXISTING ROADS, ROAD SHOULDERS AND BOULEVARDS

Comply with OPSS 402.

Where pipes are laid beneath existing paved roads, break out the pavement so that the cut edges are vertical and straight. Any irregularities will be saw cut or milled, if required, as directed by the Contract Administrator. Wheel cutting will be permitted on base course asphalt. If, a uniform edge is not obtained, re-cut asphalt prior to final paving. Take care during excavation of trenches not to undermine the portions of the existing pavement left in place.

3.12 MAINTENANCE OF TRENCHES

Maintain all trenches for a period of **two (2) years** from the date of completion. Any shrinkage or settlement during this period will be made good by the Contractor at its own expense.

3.13 ROCK EXCAVATION

Comply with OPSS 403 and OPSS 206.

Hydraulic impact methods are preferred for small quantities.

Where blasting methods are used carry out pre-blast surveys and arrange for seismic recordings of all blasts.

Excavate rock trenches 3 meters beyond the end of main line sewers or structures where directed and all lateral sewer pipes. Backfill with select excavated material.

Extend insurance coverage for damage to existing wells for a period of 24 months after total completion of the Contract.

3.14 EXCAVATION AND BACKFILL FOR STRUCTURES

OPSS 402

3.15 GRANULAR BASE COURSES

OPSS 314

3.16 HOT-MIX, HOT-LAID ASPHALT

OPSS 310

3.17 RESTORATION

Comply with OPSS 492.

Restore disturbed areas to a condition equal to or better than the original construction, but no less than the following:

Grassed Areas – 75 mm topsoil and sod or seed as indicated on contract drawings. Seed and mulch where specifically permitted.

Gravelled Areas – 150 mm Granular A

Asphalt Areas – 75 mm Granular A, 50 mm HL4, coal tar epoxy seal if existing driveway is sealed

Asphalt Roads – Comply with City of Dryden Standard R-108

Concrete Driveways – 75 mm Granular B, 100 mm concrete with wire mesh reinforcing

3.18 BOULEVARD TREE ROOT PROTECTION

Where designated in the work plan, provide specialized tree root protection measures and excavation methods to preserve existing boulevard trees when replacing/relaying existing sewer and water services.

Work to include, but not limited to, small excavation equipment, protective trench shoring measures, root cutting and non-evasive directional bore, pulling, jacking or sleeving of new service connection piping within the tree protection root zone.

Follow concepts identified in City of Dryden standard drawing M-104-4.2.

4. BASIS OF PAYMENT / MEASUREMENT FOR PAYMENT

OPSS 401, except that no payment shall be made to haul surplus material from other excavation operations within the Contract, when native material is unsuitable for backfill.

4.1 IMPORTED GRANULAR MATERIAL

Additional payment shall be made, at the unit price bid, for imported granular material when authorized by the Contract Administrator.

4.2 RESTORATION

No additional payment shall be made for restoration except where specifically noted in the Contract documents.

4.3 RE-LAY EXISTING SEWER SERVICES

Where existing service connections must be re-laid to eliminate conflicts in grade with the work, measurement for payment for the re-laying of service connections shall be taken from the end limits of the new pipe as installed and may include areas between the trench and existing sewer pipe.

The unit price bid for this item shall include the costs to install and maintain temporary service works and all work to cut into and to re-lay the service to eliminate the conflict in grade with the proposed work.

No additional payment will be made for existing water connections that have to be raised or lowered to suit sewer construction.

4.4 CRUSHED STONE

The unit price bid for this item shall include supplying, placing and compacting of crushed stone in the trench, together with the cost of additional excavation and disposal of excess material.

a) If tendered per cubic metre, measurement for payment will be to the neat calculated area of the widths and depths and lengths instructed to be placed.

4.5 BOULEVARD TREE ROOT PROTECTION

Where existing service connections must be re-laid or replaced to preserve existing boulevard trees and root zone protection, measurement for payment will be for each tree that special protection and excavation installation methods are necessary.

No additional payment will be made for sewer and water excavation beyond the root zone or if only stump removal is necessary.

1. INTENT

This section covers the construction of storm and sanitary sewers and appurtenances.

1.1 RELATED WORK SPECIFIED ELSEWHERE

Section 02555 – Concrete Structures
Section 02530 – Landscaping
Section 02570 – Excavation and Backfill of Trenches

2. PRODUCTS

Pipe – OPSS 410, Type, class and diameter as shown on the Drawings
Service Lateral Pipe – PVC SDR 28
Storm Lateral – 100 mm diameter minimum
Sanitary Laterals – 135 mm dia. min. residential, 150 mm dia. min. commercial
Manhole Catchbasins and Appurtenances – OPSS 1351
Manhole and Catchbasin Frames and Covers – OPSS 1850
Connectors to Existing Sewer Laterals – Fernco Couplers

All in accordance with the City of Thunder Bay standard drawings.

3. EXECUTION

3.1 SEWERS

OPSS 410

Minimum grade on lateral connections – 2%.

Provide closed circuit television inspection prior to placing top course asphalt. CCTV inspection to be re-verified if defects found and corrections required.

Reconnect existing services to the new sewer, where required.

3.2 FILL AND PLUG SEWERS

Fill sewers with sand, plug ends of sewers and service connections with bricks and mortar. Remove all structures to 1 metre below finished grade.

3.3 STYROFOAM INSULATION

Where, directed by the Contract Administrator or as shown on the drawings, place Styrofoam insulation.

3.4 MANHOLES CATCHBASINS AND APPURTENANCES

OPSS 407

All in accordance with City of Thunder Bay Standard Drawings.

3.5 RECONSTRUCTION OF EXISTING MANHOLES CATCHBASINS AND APPURTENANCES

The unit price per vertical metre for this item shall cover the cost of removing and replacing any masonry work and rungs in the existing structures, which in the opinion of the Contract Administrator require replacement.

This shall be in addition to the payment for resetting minus the 300-masonry limit included in that price.

4. BASIS OF PAYMENT/MEASUREMENT FOR PAYMENT

Sewers OPSS 410, except that the unit price bid shall include the cost of breaking into or connecting to existing structures, concrete appurtenances, CCTV inspection and restoration.

Manholes OPSS 407, except that payment for manholes will be at the unit price bid per vertical metre and shall include the cost of any leakage tests. Measurements will be based on the height between the top of the frame or cover and the lowest pipe invert.

Include the cost of reconnecting existing sewer connections to the new sewer in the unit price bid for the main sewer.

Include cost of removal of existing sewers in the unit price of the new sewer (where applicable).

Styrofoam insulation measurements will be taken of the area of Styrofoam insulation placed.

The unit price bid shall include all costs of excavation and placement of the insulation as shown on the drawings.

Catchbasins OPSS 407, except that if the installation or resetting of a catchbasin requires the removal and replacement of an existing curb or curb and gutter, the cost of removal and replacement, to a maximum length of 3.0 metres, shall be included in the payment for the catchbasin. This exception shall not apply to any contract, which includes payment items for replacement of existing curbs on the same street.

No additional payment will be made for existing water service connections that have to be raised or lowered to suit sewer construction.

The City reserves the right to reduce payments up to 50% of the value of the tendered price

for sewer installation dependent on the amount or restoration work that has been carried out on the section of the roadway involved.

1. INTENT

This section covers the construction of watermains and appurtenances.

1.1 RELATED WORK SPECIFIED ELSEWHERE

Section 02555 – Concrete Structures
Section 02530 – Landscaping
Section 02570 – Excavation and Backfilling of Trenches
Section 02585 – Cathodic Protection of Watermains

2. PRODUCTS

2.1 PIPE – OPSS 441

Pipe type, diameter and class as shown on the drawings

PVC pipe – AWWA C-900 DR 18

2.2 JOINTS

PVC – push on joint

2.3 THAW / TRACER WIRE

AWG No. 8/7 copper cable with RWU-90 black insulation where service connections have compression joints.

2.4 FITTINGS

PVC AWWA C-907, CAN/CSA B137.3-M-90, 200 mm and under.
All non-stainless or uncoated fittings to be wrapped in Denso tape or approved equal.

2.5 COUPLINGS

For 100 mm to 300 mm watermains, couplings shall be a Romac Alpha restrained joint coupling.

2.6 TAPPING SADDLES

Stainless steel saddles for service connections greater than 20 mm in diameter.

2.7 GATE VALVES

AWWA C-509, non-rising spindle, operating nut 50.8 mm square, opening counter-clockwise, manufactured by Mueller.

Working Pressure:
50 mm – 300 mm - 1,375 kPa
350 mm – 1,200 mm - 1,035 kPa
Triple 'O' Ring Seal

Joints, mechanical joint, 'O' Ring

Gate valves shall include valve extension stems.

2.8 VALVE BOXES

Valve Box to be a WD Valve Boxes Ltd. polyethylene SDR 18 box; Base – WD101, Casing – WD102.

Cover to be a WD Valve Boxes Ltd. WD66 cast iron cover.

2.9 HYDRANTS

All fire hydrants should be McAvity M-67b.

Minimum bury 7 feet; ports 2 x 2 ½"; pumper port 5.75"; 6 threads per inch with CSA standard threads. Manitoba threads not permitted.

Colour – Red

Drain holes plugged.

2.10 AUTOMATIC FLUSHING UNITS

Mueller Hydro-Guard 300 Series Cold Climate (FC300)

2.11 SERVICE CONNECTIONS

Corporation Stops: Mueller No. B-25000, H-15008 (20 mm and 25 mm); B-25008 (40 mm and 50 mm)

Curb Stops: Mueller Mark II Oriseal No. H15204 or H15209

Couplings: New Service - Mueller No. A319; H15403. Reconnections – Compression with jumper

Brass – All brass fittings shall be no lead type. NSF approved

Copper Pipe: Type K

Polyethylene Pipe: Series 160 or 200 Type K copper sizes

Emco product numbers refer to 20 mm size. For other sizes, use the appropriate number of the same series.

Curb Boxes: Supply with stainless steel rods, Type 304 18-8 composition. The crimp at the top of the rod shall be designed to centre position the rod in the curb box standpipe and allow for easy rod rotation.

Certify by the manufacturer, that the weld holding the bottom clip can withstand turning torques. The bottom clip to accommodate the approved curb stops.

The cotter pin shall be stainless steel.

Trace/thaw cable fasteners.

Copper services – electrical grounding clamp.

Polyethylene services – electrical tape.

Curb Boxes for various sizes shall be as follows:

<u>20 mm – 25 mm</u>

Mueller No. A726 with a 300 mm adjustable telescopic box with Mueller No. A800 ribbed cover and a Mueller stainless steel rod (304SS) of a length to place the top of the rod 1 metre below the finished grade.

<u>40 mm – 50 mm</u>

Mueller No. A753 with a 300 mm adjustable telescopic box with Mueller No. A800 ribbed cover, a Mueller stainless steel rod (304SS rod) of a length to place the top of the rod 1 metre below the finished grade.

2.12 STYROFOAM INSULATION

H.I. plastic foam soil insulation as manufactured by Dow Chemical of Canada, or approved equal

2.13 AIR RELIEF VALVES

Vent-O-Mat 50RBX, or equal, 50 mm in diameter

2.14 CONCRETE

OPSS 1350

3. EXECUTION

3.1 PIPE AND APPURTENANCES

OPSS 701

Comply with the manufacturer's recommendations.

3.2 SHOP DRAWINGS

Submit shop drawings for all valves, hydrants and appurtenances and for concrete pressure pipe for review prior to delivery.

3.3 TEST CERTIFICATES

Provide certified test certificates for watermain pipe.

3.4 VALVES

OPSS 701

Inspect 'O' ring seals and tighten glands before installation.

3.5 ANCHORAGE AND THRUST BLOCKS

Install tie-rods and thrust blocks at all watermain bends and tees per COTB Standards W-108-1, W-108-2, and W-109.

Use concrete thrust blocks where soil conditions provide firm support. Use tie rods in poor soil conditions and where specifically required by the drawings.

3.6 THAW / TRACER WIRE

Install thaw / tracer wire along all non-metallic watermains and service connections. Secure wire to pipeline with electrical tape at 3 metre intervals. Cadweld wire to hydrant boots.

Loop wire around hydrants and valves, leaving slack in the cables to permit future removal of the fitting.

Test for conductivity following backfill of trenches.

3.7 FIRE HYDRANTS

OPSS 701

3.8 AUTOMATIC FLUSHING UNITS

Mueller Hydro-Guard 300 Series Cold Climate (FC300) installed to watermain depths shown in the Contract Drawings, and outlet to the Storm Sewer network.

Refer to manufacturers specifications for full installation instructions.

Flushers shall include fully programmed BL-KR battery powered irrigation module to be operated via Bluetooth to the City of Dryden's existing communications.

3.9 TIE-IN TO EXISTING MAINS

Confirm outside diameter of existing mains before proceeding with the work.

Prior to tying into existing pressurized watermains, make arrangements with the City's Public Works Department to temporarily reduce or shut off pressure where there is risk of movement due to the pressure.

Use tapping sleeves where specified. Otherwise, connections to existing mains shall be made using cut in tees and required fittings.

Use similar main materials for lowerings, hydrant branches when tieing into existing system.

3.10 FLUSHING AND DISINFECTION OF WATERMAINS

OPSS 441

Access points for chlorination shall be within 3 metres of all dead ends, in accordance with AWWA 651.

Disinfection of watermains shall be in accordance with the Ontario Watermain Disinfection Procedure.

New main work shall be physically separated from existing distribution system until after disinfection of new work. Physical separation may include an air gap, an approved RP Back Flow Preventer (Ontario Watermain Disinfection Procedure), but not a closed distribution valve. Note: the blind flange does not meet the standard without an air gap and should be removed.

For preliminary flushing prior to disinfection referred to in Sections 4.4.2 and 4.5.2 of ANSI/AWWA Standard C651, if the requirements of ANSI/AWWA Standard C651 for a velocity of 3.0 ft/sec (0.91m/sec) are not practical, alternative cleaning consisting of

swabbing or flushing 2-3 pipe volumes can be used at the discretion of the Operating Authority.

The Contractor is advised that results for bacteriological testing typically require 72 hours.

Bacteriological sampling shall be in accordance with AWWA Standard C651.

Swab all watermain pipe and fittings, not subject to flushing and disinfection, with chlorine solution with 50 mg/liter chlorine concentration, prior to installation.

Discharge chlorinated water to sanitary sewers where available. Dechlorinate all superchlorinated water. De-chlorinate water, if chlorine residual is not otherwise eliminated, before discharge to a watercourse.

Make provisions through blow offs or flushing to maintain water quality within the existing distribution system at locations created by isolation for the new work. All flushing water must be dechlorinated.

3.11 NOTIFICATION OF SHUT-OFFS

Where shutoffs are required in order to make connections, the Contractor is to contact the City of Dryden Waterworks department and the Contract Administrator 48 hours in advance. Water users in the area are to be given notice at least 24 hours in advance – overnight notice is preferred of the time of shutoffs and the anticipated duration. All shutoffs shall be performed by the City of Dryden.

If there are extenuating circumstances that prohibit a water shutdown, the Contractor is responsible to arrange rescheduling of the shutdown or provision of temporary water service. Connections to existing watermains may require weekend work or night work due to water requirements of local customers.

3.12 TEMPORARY WATER SERVICE

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Provide and maintain temporary water services to houses and businesses that are disconnected or isolated from the watermain, during the watermain construction for durations greater than 8 hours.

Submit the proposed method of temporary water supply to the Contract Administrator for approval at least 14 days prior to starting the work. All supply piping or hoses shall be CSA approved for potable water use and shall be disinfected and flushed prior to use.

Provide for continuous bleeding of temporary water supplies to maintain water quality.

Disinfection of watermains shall be in accordance with the Ontario Watermain Disinfection Procedure.

Bacteriological sampling shall be in accordance with AWWA Standard C651.

Connect the temporary water supply to the City's distribution system using approved backflow prevention devices (AWWA Standard C651). Backflow prevention devices can be supplied by the City at no cost to the contractor.

Dechlorinate and flush the water service connection prior to returning the service to normal operation.

3.13 RECONNECTION OF EXISTING WATER AND SEWER CONNECTIONS

Upon the completion of testing and disinfection of the watermain, reconnect existing water connections.

Install pipe of same diameter as existing service with minimum diameter of 20 mm.

3.14 ABANDONING WATERMAINS

Fill watermains larger than 250 mm with sand, plug open ends with bricks and mortar, turn off main stops and crimp the open ends of abandoned water services.

Remove and salvage curb boxes and valve boxes from abandoned water service connections and watermains. Remove all structures to 1 metre below finished grade.

Where a line to be abandoned is connected to a main, which will remain, remove the connecting fitting and replace with a straight pipe or revised fitting as appropriate.

3.15 OPERATION OF VALVES

The operation, of water valves and curb stops, in connection with the watermain work, shall be conducted by the City of Dryden's Public Works Department only. The Contractor shall give 48 hours notice.

3.16 CHEMICALS AND MATERIALS

All chemicals and materials used in the alteration or operation of the drinking water system, that come into contact with water within the system, shall meet all applicable standards set by both the American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/14, NSF/60, NSF/61 and NSF/372.

The Contract Administrator may request additional documentation from the Contractor to ensure that all chemicals, materials, products, etc. meet the above criteria.

4. BASIS OF PAYMENT / MEASUREMENT FOR PAYMENT

4.1 AUTOMATIC FLUSHING UNITS

Price tendered for each unit shall include all labour, materials and equipment to complete the work. Unit price bid includes but is not limited to the cost for excavation, installation and backfill of the Flushing units, including connection into the storm sewer network, and all labour materials and equipment required for the wireless communication.

1. GENERAL

This section covers the construction of cathodic protection for metallic underground pipelines.

1.1. RELATED WORK SPECIFIED ELSEWHERE

Section 02530 – Landscaping
Section 02570 – Excavation and Backfilling of Trenches
Section 02580 – Watermains

2. PRODUCTS

2.1. SACRIFICIAL ANODES

Sacrificial anodes are supplied in cardboard containers holding the anode, selected packaging material and 3000 mm of AWG No. 10/7 strand copper cable with RWU-90 blue insulation for magnesium anodes and RWU-90 white insulation for zinc anodes. The cable is silver soldered to the steel core of the anode casting.

Zinc anodes ASTM B418 Type II – 24 lbs.
Magnesium anodes ASTM B843 – 32 lbs.

2.2. TEST STATIONS

Post-mounted – 2440 mm long Carsonite Permapost
Flush-mounted – Handley Model T4-3-2

2.3. BOND CABLES

AWG No. 2/7 strand copper wire with RWU-90 black insulation.

2.4. WATERMAIN TEST LEADS

AWG No. 8/7 strand cable with RWU-90 black insulation.

Compression connectors – C-taps (grey dye, as manufactured by Thomas and Betts).

Electrical tape – 20 mm PVC.

Waterproof tape – 25 mm Neoprene rubber as manufactured by Bishop.

Mastic - Royston Roskote – A-51 Master or approved equal.

Cadweld Cartridges and moulds:

i) Ductile Iron Pipe – for bond cables.
Cartridge: Cadweld – CA 32.
Mould: 200 mm or less CAHAA-1VB – 250 mm to 350 mm CAHAA-1VC - 400 mm or greater CAHAA-1V.

ii) Ductile iron pipe – for anode and test leads:
Cartridge: Cadweld – CA-15.
Sleeve (anode lead only): Cadweld CAB-133-1H.
Mould: CAHAA-1G.

iii) Cast iron pipe – for bond cables:
Cartridge: Cadweld CA4SXF-19.
Mould: Cadweld CAEA-1G-XX - where “XX” is pipe diameter in inches.

3. EXECUTION

3.1. EXISTING WATER SYSTEMS

Whenever an existing metallic structure associated with a waterworks system is exposed, install 32 lb. magnesium anodes as follows:

Tees, crosses, bends, reducers – 1
Fire hydrants – 1
Curb stops – 1
Copper water service – first 6 metres – 1; each additional 6 metres – 1.

3.2. NEW WATER SYSTEMS

When installing new watermain systems, install 24 lb. zinc anodes on metallic structure, as follows:

Tees, crosses, bends reducers – 1, Note: Multiple fittings (up to 4 maximum) can be protected by a single anode if they are all located within 3.0 m of each other.
Fire hydrants – 1
Exposed copper services – 1
New copper service – first 6 metres – 1; each additional 6 metres – 1.

3.3. TEST STATIONS

OPSS 442.

3.4. ELECTRICAL CONDUCTIVITY

Bond all pipe joints, fittings and electrical discontinuities in the piping system, as shown on the drawings, to ensure electrical conductivity.

Test to verify conductivity upon completion.

3.5. INSTALLATION OF ANODES

Install anodes in accordance with manufacturer's recommendations and as shown on the drawings. Leave sufficient slack in lead wires to prevent stress on connections due to backfilling.

Connect anodes to copper services using Burndy Corrosion Resistant Bronze Ground connection with durium hardware. Use Model GA2 for pipe sizes up to 25.4 mm in diameter, use Model GA3 for pipe sizes 31.75 mm to 50.8 mm in diameter.

3.6. INSTALLATION OF TEST STATIONS

Install test stations as recommended by the manufacturer and as shown on the drawings.

Leave sufficient slack in the test leads to prevent stress on the connections due to backfilling.

Anode lead wires may be extended by splicing an additional length of the same cable material using a compression connector. The splice shall then be covered with two layers of waterproof tape followed by two layers of electrical tape.

Compact the ground immediately adjacent to the test station to ensure its stability.

3.7. ELECTRICAL BONDING OF JOINTS

Thermite weld one bond cable as specified across every pipe-to-pipe and pipe-to-fitting joint. CAB-133-1H sleeves are not required for bond cables.

Coat the thermite welds and the exposed surface of the pipe liberally with mastic.

Remove bare copper bands if supplied with the piping.

Do not use bare copper bond straps, conductivity screws or conductivity wedges to provide electrical continuity.

3.8. ELECTRICAL BONDING OF EXISTING PIPING

Perform a test cadweld on a sample section of the removed pipe to ensure the weld does not perforate the pipe's inner wall.

Where possible, install bond cable to the existing pipe prior to installation of new replacement section. Visually inspect the inner surface after welding.

3.9. TESTING OF CATHODIC PROTECTION SYSTEMS

Carry out a cathodic protection survey on the watermain between 60 and 120 days following the installation of the anodes, and prior to acceptance of the watermain by the Contract Administrator.

Conduct the survey by a NACE accredited Corrosion Technician or a Professional Engineer experienced in the evaluation of cathodic protection systems, as approved by the Contract Administrator.

Conduct the survey as follows:

- Measure and record the watermain potentials at 5.0 meter intervals with the watermain connection made to a watermain test lead.
- Measure and record the anode output currents at all test stations.
- Measure and record the pipe potential at all test stations with the anode-to-pipe connection both connected and disconnected.
- Check electrical continuity of watermain between test stations, and from each test station to electrical neutral.

Measure pipe potentials with respect to a saturated $Cu/CuSO_4$ reference electrode using a high impedance (> 10 mega-ohms) voltmeter.

Submit a comprehensive written report, including all data obtained during the survey, to the Contract Administrator. Include recommendations pertinent to the continued effectiveness of the cathodic protection system.

4. BASIS OF PAYMENT / MEASUREMENT FOR PAYMENT

The unit prices tendered for the various works to be constructed shall include the cost of all corrosion protection works and no separate payment will be made.

1. INTENT

This section covers the construction of sanitary sewage forcemains and appurtenances.

1.1 RELATED WORK SPECIFIED ELSEWHERE

Section 02530 – Landscaping
Section 02570 – Excavation and Backfilling of Trenches

2. PRODUCTS

Pipe - High density polyethylene pipe complying with OPSS 1842 and of the size and class shown on the drawings.

Gates Valves – AWWA C-509 Non-rising spindle, mechanical joint ‘O’ ring seal.

Air Relief Valves – A.R.I.D-025 Air Valve with 75mm connection.

Bedding – Compactable granular material with no stones greater than 25 mm in diameter.

Granular Backfill – Granular B complying with OPSS 1010.

3. EXECUTION

OPSS 412, except that leakage allowances will comply with OPSS 701.

4. BASIS OF PAYMENT / MEASUREMENT FOR PAYMENT

OPSS 412, except that the unit price bid for this item shall include the cost of all restoration, fittings and connections to structures.

SANITARY LIFT STATION
SPECIFICATIONS

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section specifies requirements for concrete formwork, falsework, and their accessories for concrete construction.

.2 Work includes design, construction, erection, and removal of concrete formwork, falsework, and accessories.

1.2 REFERENCE STANDARDS

.1 Current editions of reference standards to be applicable.

.2 Canadian Standards Association (CSA):

.1 CSA A23.1, Concrete Materials and Methods of Concrete Construction.

.2 CSA A23.2, Methods of Test for Concrete.

.3 CSA S269.1, Falsework and Formwork.

.3 American Concrete Institute (ACI):

.1 ACI 315, ACI Detailing Manual.

.2 ACI 347, Guide to Formwork for Concrete.

1.3 DESIGN

.1 Design of concrete formwork and falsework are responsibility of Contractor.

1.4 SUBMITTALS

.1 Submittals to be in accordance with Section 01000 and CSA A23.1.

.2 Submit shop drawings of proposed formwork and/or falsework for review if requested.

.3 Show material sizes and grades and spacing of members.

.4 Indicate rate and sequence of concrete placing used in design of formwork.

.5 Shop drawings to bear seal of a qualified Professional Engineer registered in Ontario.

.6 Submit for review shoring and reshoring provisions and removal schedules.

.7 Submit for review proposed hoarding and heating methods for cold weather concreting.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Comply with OPSS.MUNI 100

Part 2 Products

2.1 FORMS

.1 Use material of suitable strength and quality to produce specified surface finish.

.2 Use forms which are watertight, non-warped, non-absorbent, and non-staining.

.3 Formwork lumber: plywood and wood formwork materials to CSA A23.1.

.4 Falsework materials: to CSA S269.1, Table 1- Materials to bear grade marks or be accompanied with certificates, test reports, or other proof of conformity.

2.2 FORM TIES

.1 Use only ties with ends removable to a distance of not less than 38 mm from the face of the finished concrete.

.2 Form ties with a removable cone cast in the concrete shall produce a cone hole not more than 25 mm in diameter.

Part 3 Execution

3.1 INSPECTION

.1 Notify Engineer to permit inspection of formwork at least 72 hours before concreting. Inspection by Engineer of formwork to be for conformance to project specifications, but not for structural strength and stability, which is sole responsibility of Contractor.

.2 Obtain approval from Engineer prior to placing concrete.

3.2 CONSTRUCTION AND CONTRACTION JOINT LAYOUTS

.1 Construction and contraction joints to be constructed where required as shown on Drawings, as specified and/or according to CSA A23.1. Contractor to prepare and submit for review, a location diagram and proposed details for all planned construction and contraction joints.

.2 Construction joints to be approved by Engineer.

.3 Clean all construction joint surfaces that will be inaccessible after erection of formwork to Section 03 30 00.

.4 Construct falsework to CSA S269.1.

3.3 FORMS

.1 Assemble and erect in accordance with the formwork design.

.2 Allow for deflection of the formwork due to the weight of concrete.

.3 Make all form joints watertight.

.4 Make form surfaces smooth and flat.

.5 Clean forms properly before assembling in position, and as necessary before concreting.

.6 Oil or coat forms before assembly in final position.

.7 Provide access for cleaning prior to concreting.

.8 Do not use temporary removable spacers or blocks to support reinforcement or other items unless approved by the Engineer.

.9 Finished concrete exhibiting evidence of excessive form displacement, and/or excessive deflection shall be cause for rejection of the work and its removal and replacement at the Contractor’s own expense.

.10 Obtain Engineer's approval before framing openings not indicated on drawings.

3.4 TOLERANCES

.1 Construct formwork to maintain tolerances of concrete work to CSA A23.1.

.2 Provide cambers to beam and slab forms as indicated on Drawings, as directed, or in accordance with following:

.1 Beams - 5 mm per 3000 mm of span.

.2 Slabs - 8 mm per 3000 mm of span.

3.5 PLACING OF CONCRETE

.1 Make a final inspection and ensure that forms are satisfactory and no deleterious materials are present inside area to be concreted.

.2 Observe forms during concreting operations and correct any displacement of forms.

3.6 FORM REMOVAL

.1 Remove forms so that no damage occurs to concrete. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against concrete surfaces.

.2 Consider location, character of structure, weather, and other conditions influencing curing of concrete, in determining time for removal of forms. Refer to Section 03 30 00 – Cast-in-Place Concrete and CSA A23.1.

.3 Leave shores in place until concrete has attained sufficient strength to adequately support its own weight together with construction loads likely to be imposed. Leave formwork in place for minimum periods of time after placing concrete.

.1 Vertical Surfaces - minimum 24 hrs provided that the curing is in accordance with Clause 7.4 of CSA A23.1. (confirm with Engineer before removing formwork)

.2 Other Surfaces - Until concrete has attained 2/3 of the specified 28 day strength, or to the Engineer’s approval.

.4 Reshore structural members including beams and slabs immediately after removing formwork. Reshoring shall be designed to support and distribute all loads that will be imposed until the specified concrete design strength has been achieved and all construction loading exceeding the member serviceability and design capacity has been removed.

.5 Remove formwork progressively and in accordance with Building and Safety Code requirements and so that no shock loads or unbalanced loads are imposed on structure.

.6 Concrete curing procedures to commence immediately after form removal. Refer to Section 03 30 00 – Cast-in-Place Concrete for leaving some formwork in place as part of curing procedures.

.7 Re-use of formwork and falsework subject to requirements of CSA A23.1.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section specifies requirements for supply, fabrication, and placing of reinforcing steel, including necessary supports, spacers, and related accessories.

1.2 REFERENCE STANDARDS

.1 Current editions of reference standards to be applicable.

.2 CSA A23.1, Concrete Materials and Methods of Concrete Construction.

.3 CSA A23.3, Design of Concrete Structures.

.4 CSA G30.18, Billet-Steel Bars for Concrete Reinforcement.

.5 ASTM A1064/A1064M, Welded Steel Wire Fabric for Concrete Reinforcement.

.6 ACI 315, ACI Detailing Manual.

.7 CRSI Manual of Standard Practice.

1.3 SUBMITTALS

.1 Submit shop drawings per Section 01000, at least 10 days before fabrication.

.2 Submit bending schedules and placing drawings.

.3 Show bar size, spacing, location, and quantities to permit correct placement without reference to Drawings.

.4 Provide details to show placement of reinforcing where special conditions occur.

.5 Details: to ACI 315.

.6 Submit certificates and mill tests for material supplied as requested by Engineer.

.7 Design and detail lap lengths and bar development lengths to CSA A23.3 unless otherwise indicated.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

.1 Ship bar reinforcement in standard bundles, easily identifiable, and marked to bar lists.

.2 Store reinforcement to prevent deterioration or contamination by dirt, detrimental rust, loose scale, paint, oil, or other foreign substances that will destroy or reduce bond.

.3 Do not straighten or re-bend reinforcement in any manner.

.4 Do not use bars kinked or bent by improper handling or storage.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Comply with Section OPSS.MUNI 100.

Part 2 Products

2.1 REINFORCING STEEL

.1 Reinforcing steel to meet CSA G30.18. Steel grade to be 400 MPa.

.2 Welded steel wire fabric to ASTM A1064/A1064M, provide in flat sheets only.

2.2 CHAIRS, BOLSTERS, BAR SUPPORTS, SPACERS

.1 Provide adequate support of reinforcement (according to CRSI Manual of Standard Practice).

.2 For exposed or architectural concrete surfaces use accessories that are plastic coated, stainless steel, or as indicated on Drawings.

.3 Precast concrete block supports must be equal in strength and quality to concrete in structure and with a maximum plan dimensions of 50 mm x 50 mm.

.4 Chairs, bolster bar supports, and spacers to have sufficient strength to support reinforcing under normal construction conditions. Do not use brick for bar supports.

.5 Side form spacers to be non-corrosive PVC spacers, purpose made. Do not use steel bar chairs, galvanized bar chairs, PVC chairs, concrete bricks, broken concrete blocks, or wood supports for side form spaces.

2.3 FABRICATION

.1 Fabricate reinforcing steel from bar sizes and grades indicated within following tolerances:

- .1 Sheared length: plus 0, minus 25 mm.
- .2 Stirrups, ties, and spirals: plus 0, or minus 13 mm.
- .3 Location of bends: plus 0, or minus 25 mm.

.2 Unless otherwise indicated, fabricate to CSA A23.1.

Part 3 Execution

3.1 INSPECTION

.1 Reinforcing for all concrete castings to be inspected after reinforcement placing is completed and prior to concreting.

.2 Provide minimum 72 hours notice before scheduled pours to facilitate inspection of reinforcement.

3.2 PLACING OF REINFORCEMENT

.1 Place reinforcement as shown on reviewed shop drawings and to CSA A23.1.

.2 Support reinforcement in position as follows:

- .1 Beams, walls, and columns: laterally support reinforcement with supports in pairs on opposite faces.
- .2 Do not use supports that will be forced into supporting formwork or soil by weight of reinforcement or other construction loads.

.3 Separate layers of bars by precast mortar blocks, bars, or equally suitable devices. Do not use pebbles, pieces of broken stone or brick, metal pipe, or wooden blocks.

.4 Do not place bars on layers of fresh concrete as work progresses or install bars during placing of concrete.

.3 Provide concrete cover as detailed on Drawings.

3.3 WELDING OF REINFORCEMENT

.1 Welding of reinforcing bars is not permitted.

3.4 SPLICING OF REINFORCEMENT

.1 Splice bars only as shown on Drawings, reviewed placing drawings, or approved by Engineer.

.2 Bar splices to conform to CSA A23.3, Class B tension lap splice, unless noted.

.3 Lap adjacent sheets of wire fabric to provide an overlap of at least one cross wire spacing plus 50 mm, measured between outermost cross wires of each sheet.

3.5 DETAILS

.1 Corner bars: install corners bars in walls and beams to match larger size of main reinforcement unless otherwise noted on Drawings.

.2 Openings in slabs or walls: unless otherwise noted on Drawings, install 2 additional bars, size matching main reinforcing, on all sides of every opening, one near each concrete face or number of bars intercepted, divided equally between two sides, whichever is greater. Bars to extend one lap length past each side of opening.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section specifies requirements for design and preparation of concrete mix, handling, placing, finishing, and curing of cast-in-place concrete.

1.2 RELATED WORK

.1 Division 3 – Concrete: concrete work and materials specified in related sections.

.2 Work specified elsewhere requiring inserts and openings in concrete.

1.3 REFERENCE STANDARDS

.1 Current editions of reference standards to be applicable.

.2 American Concrete Institute (ACI):

.1 ACI 306R, Guide to Cold Weather Concreting.

.2 ACI 350, Code Requirements for Environmental Engineering Concrete Structures.

.3 Canadian Standards Association (CSA):

.1 CSA A23.1/CSA A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.

.2 CSA A23.3, Design of Concrete Structures.

.3 CAN/CSA-A3000, Cementitious Materials Compendium.

.4 CSA A266.2, Chemical Admixtures for Concrete.

.4 ASTM International (ASTM):

.1 ASTM C260/C260M, Standard Specification for Air-Entraining Admixtures for Concrete.

.2 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.

.3 ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.5 Have available on site one copy of CSA A23.1/CSA A23.2. These to form basis for acceptable standards of concrete practices and methods.

1.4 QUALITY CONTROL PLAN

.1 Cast-in-place concrete to conform to CSA A23.1. Deliver concrete under Performance Alternative as outlined in CSA A23.1, Table 5.

.2 Contractor to be fully responsible for quality control of all aspects of production, pre-placement, placement, and post-placement of concrete and related testing.

.3 Concrete testing to be performed by a CSA A23.1 certified Third Party Testing Agency. Testing to conform to CSA A23.1/A23.2. Third Party testing to be paid for by Contractor.

.4 Distribute Third Party Testing Agency test data to Engineer and Owner immediately upon receiving.

.5 If any tests reveal concrete not meeting Specifications, the Engineer may enforce one or more remedial procedures such as:

.1 change in mix design

.2 change in concrete supplier

.3 additional testing by coring or impact hammer

.4 replacement of work

.5 other procedures as necessary

.6 The costs of remedial work to bring concrete to meet specifications shall be borne by the Contractor.

.7 Submit mix design statements for each type of concrete:

.1 Mix design statements to be sealed and signed by a Professional Engineer registered in Province of Ontario experienced in preparing concrete mix designs.

.2 Submit documentation a minimum of four (4) weeks prior to first scheduled concrete casting demonstrating that proposed mix designs and materials will achieve required strength, durability, and performance requirements.

.3 Clearly correlate mix design statements to concrete specifications in Controlled Concrete Table shown on Drawings.

1.5 QUALITY ASSURANCE

.1 A minimum four weeks prior to starting concrete work, submit proposed quality control procedures for Engineer's review for the following items:

.1 Hot weather concrete

.2 Cold weather concrete

.3 Curing

.4 Finishing

.2 Checklists supplied by Contractor will be used for reviewing Work.

.3 Notify Engineer at least 72 hours before completed formwork, embedded items, and concrete reinforcement is ready for review. Contractor to schedule review of embedded items and reinforcing in walls prior to closing forms.

.4 Allow ample time for review, and corrective work, if required, before scheduling concrete placement.

.5 Owner reserves right to arrange and pay for a CSA A23.1 certified Third Party Testing Agency to test concrete works. Provide unencumbered access to all portions of Work and cooperate with appointed Third Party Testing Agency.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

.1 Store all material to CSA A23.1, Storage of Materials, except as otherwise noted.

.2 Store each shipment of cement separately to provide access to identification and inspection of each shipment.

.3 Clean stockpile areas of foreign materials.

.4 Do not use stockpiled material within 150 mm of ground surface if stockpile is placed directly on ground.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Comply with OPSS.MUNI 100.

Part 2 Products

2.1 CONCRETE MATERIALS

.1 Portland Cement: Type GU or GUb and Type HS or HSb conforming to CAN/CSA-A3000.

.2 Supplementary cementing materials: conforming to CAN/CSA-A3000.

.3 Fine aggregate: conforming to Normal-Density Fine Aggregate, CSA A23.1, Tables 10 and 12.

.4 Coarse aggregate: conforming to Normal-Density Coarse Aggregate, CSA A23.1, Table 11 and 12.

.5 Water: potable, clean, and free from injurious amounts of oil, alkali, organic matter, or other deleterious matter, to CSA A23.1, Table 9.

.6 Materials are to be obtained from same source of supply or Manufacturer for duration of project.

2.2 ADMIXTURES

.1 Air entrainment: to ASTM C260/C260M. No other air entraining mixture to be used regardless of type of cement selected, unless permitted by Engineer.

.2 Chemical admixtures, water-reducing agent, superplasticizer: to ASTM C494/C494M and ASTM C1017/C1017M.

.3 Admixtures containing chlorides will not be permitted.

2.3 CONCRETE MIXES

.1 Provide concrete mixed to CSA A23.1 and this specification Section. Pay all costs for mix designs.

.2 Concrete design compressive strength and class of exposure as indicated on Table on Drawings. Concrete mix designs to mitigate dry and plastic temperature and shrinkage cracks.

.3 Use accelerating admixtures in cold weather only when permitted by Engineer. If permitted, use of admixtures will not relax cold weather placement requirements. Do not use calcium chloride.

.4 Use set-retarding admixtures during hot weather only when permitted by Engineer.

.5 All admixtures are subject to acceptance by Engineer. List all proposed admixtures in mix design statement submission. Do not change or add admixtures to accepted design mixes without Engineer's review and acceptance.

.6 Concrete delivered to site to be accompanied by delivery slip to CSA A23.1.

.7 Self consolidating concrete mixes will not be permitted for use on this project.

2.4 CONCRETE CURING COMPOUND

.1 Chlorinated rubber type compound: to CSA A23.1, Type 1.

.2 On coloured floors: wax-free curing and sealing compound, "Floor Coat", as manufactured by Master Builders Co. Ltd.

.3 Ensure adequate surface preparation of concrete for proper bonding where waterproofing or dampproofing are to be applied.

2.5 SLURRY MIX

.1 Slurry mix to have an excess of mortar obtained by omitting 20 to 50 percent of coarse aggregate from normal mix to achieve good flowing characteristics.

2.6 MIXING

.1 Ready-mixed concrete:

.1 Mix premixed or Transit-mixed concrete: to CSA A23.1 and ASTM C94.

.2 Ensure concrete supplier has sufficient plant capacity and transporting apparatus to provide delivery so intervals between successive loads do not exceed 15 minutes.

.2 Site-Mixed Concrete: to CSA A23.1.

Part 3 Execution

3.1 INSPECTION

.1 Immediately before concrete is placed, Contractor to carefully inspect all forms to Section 03 10 00, to ensure forms are properly placed, sufficiently rigid and tight, and that all reinforcing steel and embedded parts are in correct position and secured against movement during placing operation. All forms to be thoroughly cleaned and foreign material removed.

.2 Engineer will inspect forms, foundations, reinforcing steel, construction joints, mixing, conveying, placing equipment, and curing preparations before concreting.

3.2 PREPARATION

.1 Do not place concrete on soil that has been softened by mechanical disturbance or moisture.

.2 Retighten forms at construction joints.

.3 Roughen, thoroughly remove foreign matter and laitance, and saturate hardened concrete at construction joints with water prior to concreting.

.4 Make suitable arrangements to prevent damage to fresh concrete by adverse weather conditions, such as rain, wind, or extreme temperatures.

.5 Do not cast concrete against frozen ground, frozen concrete, or into frosted formwork.

.6 Prepare all sleeves and ducts to be cast into concrete at same time as concrete formwork to ensure that correct assembly, fit, and location is obtained.

.7 Check architectural, mechanical, and electrical Drawings for sleeves, inserts, etc.

.8 Set sleeves, ties, anchor bolts, pipe hangers, and other inserts and openings in concrete slabs and walls as required.

3.3 INSERTS

.1 Set hatch and sump frames, pipe, sleeves, ties, anchor bolts, pipe hangers, and other inserts, openings, and sleeves in concrete floors and walls as required by other trades. Sleeves, openings, etc., greater than 100 mm x 100 mm not indicated on Drawings must be approved by Engineer.

.2 No sleeves, ducts, pipes, or other openings to pass through beams except where expressly detailed on structural Drawings or permitted by Engineer.

.3 Do no eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of all modifications from Engineer before placing of concrete.

.4 Check locations and sizes of sleeves, openings, etc., shown on structural Drawings and on architectural, mechanical, and electrical Drawings.

3.4 PLACING OF CONCRETE

.1 Place concrete to CSA A23.1, and as specified herein.

.2 All formwork to be cleaned of all debris, loose material, snow, and ice immediately prior to casting.

.3 Ensure proper placement and support of reinforcement and embedded material immediately ahead of casting.

.4 Do not temporarily displace reinforcement for convenience in placing concrete.

.5 Do not use wood or other temporary spreaders or spacers.

.6 Do not insert reinforcement into fresh concrete.

.7 Confine concrete in a suitable vertical drop pipe to within 1.0 m or less of concrete in place.

.8 Set screeds accurately for level surfaces or to maintain cambers as required.

.9 Ensure that concrete is adequately consolidated in forms.

.10 Place concrete in such a manner that concrete in form is still plastic and can be integrated with fresh concrete.

.11 To prevent segregation, deposit concrete in approximately horizontal layers of 300 mm to 450 mm thickness, as near as possible to its final position.

3.5 COLD AND HOT WEATHER REQUIREMENTS

.1 Deliver, place, and cure concrete in hot or cold weather to CSA A23.1.

3.6 CONSTRUCTION TOLERANCE

.1 Concrete work to be carefully and accurately set out; true to positioning, levels, slopes, and dimensions shown on Drawings and to following tolerances:

.1 Sizes of member or thickness of slabs: + 6 mm, - 0 mm.

.2 Cover of concrete over reinforcement: ±3 mm.

.3 Variations from plumb: 6 mm in 3.0 m, 10 mm maximum.

.4 Variations from flat: 3 mm in 3.0 m, 6 mm maximum.

.2 If these tolerances are exceeded Contractor may, at discretion of Engineer, be required to remove and replace or to modify placed concrete before acceptance. Costs incurred by Engineer for such investigation, testing, or review of reconstruction and cost of reconstruction to be responsibility of Contractor.

3.7 FINISHING

.1 Finishing to CSA A23.1 and as specified herein.

.2 Finishing wall surfaces:

.1 Finish wall surfaces to CSA A23.1, Clause 7.9, Finishing formed surfaces.

.2 Finishes of water retaining structures: form liner finish. See Section 03 25 00, Concrete Accessories.

.3 Finishes exposed to public view: smooth-form finish.

.4 Finishes not exposed to public view: rough-form finish.

.5 Patch surface defects to CSA A23.1, Clause 7.9.2.4, Surface defects. Fill bugholes per note (2) for surfaces of water retaining structures.

.3 Finishing concrete slab surfaces:

.1 Screeding, floating, and troweling to CSA A23.1, Clause 7.6 Finishing of concrete floor surfaces.

.2 Floor surfaces to be finished to CSA A23.1 Table 21, Slab and floor finish classification, Class A.

.3 Walkways, driveways, landings, and slabs on grade to receive a broomed finish with regular corrugations not more than 3 mm deep.

.4 Troweled finish for service area floor slabs:

.1 After completion of floated surface finish, trowel to produce a dense smooth finish.

.2 Follow with additional steel troweling to produce smooth burnished surface.

.3 Apply curing compound to Manufacturer's instructions.

.5 Workmanship for floor slabs:

.1 Steel trowelled concrete slabs to be left exposed.

.2 Where floor drains occur, floors to be level around walls and have a minimum 1% uniform pitch to drains, unless indicated otherwise on Drawings.

.3 Concrete slabs to receive protective coating to be screeded off to true lines and levels shown and left ready to receive finish.

.4 Concrete that is to receive protective coating to be cleaned free of dirt, oil, loose material, and laitance to Manufacturer's requirements.

3.8 CURING

.1 Cure and protect freshly placed concrete to CSA A23.1 and as specified herein.

.2 All concrete: Table 19, Type 2 Additional curing for a period of at least 7 calendar days. One of following methods to be used as soon as concrete has hardened sufficiently to prevent marring:

.1 Surface covered with canvas or other satisfactory material and kept thoroughly and continuously wet with soaker hoses.

.2 A liquid membrane forming curing sealer, applied at rate recommended by Manufacturer. Curing sealer not to be used on surfaces where bond is required for finishes.

.3 Surfaces of concrete that are protected by formwork left in place for 7 calendar days do not require any additional curing (except as specified for hot weather). If formwork is removed in less than 7 calendar days, concrete to receive moist curing as above.

.3 No concreting will be allowed until all materials required for curing phase are on-site and ready for use.

.4 Concrete allowed to freeze or attain insufficient curing conditions is subject to all necessary investigations and testing as deemed necessary by Engineer and all such concrete to be removed and portion reconstructed as directed by Engineer, at Contractor's cost.

.5 Supply and arrange for water for curing concrete.

3.9 FORM REMOVAL

.1 Forms not to be removed until removal operations will cause no damage to concrete surfaces.

.2 At end of curing and protection period, temperature of concrete to be reduced gradually at a rate meeting requirements of CSA A23.1 Table 20 for allowable differential temperature in concrete and ACI 306R Table 5.1 for allowable rate of temperature change of edges of concrete until outside air temperature has been reached.

.3 Beam and slab soffit forms not to be removed until sufficient strength has been attained for support of applied dead and live loads and to minimize deflections.

.4 See CSA A23.1, Clause 6.5 Forms, for specific requirements.

3.10 DEFECTIVE CONCRETE

.1 Concrete not meeting requirements of Specifications and Drawings will be considered defective concrete.

.2 Concrete not conforming to lines, details, and grades specified herein or as shown on Drawings to be modified or replaced at Contractor's expense and to satisfaction of Engineer. Finished lines, dimensions, and surfaces to be correct and true within tolerances specified herein and in Section 03100 - Concrete Formwork.

.3 Concrete not properly placed resulting in honeycombing and other defects to be repaired or replaced at Contractor's expense and to satisfaction of Engineer.

3.11 REPAIR

.1 Allow Engineer to review concrete surfaces immediately upon removal of all formwork.

.2 Remove all exposed metal form ties, nails, and wires, break off fins, and remove all loose concrete.

.3 Any imperfect joints, voids, stone pockets, or other defective areas and tie holes to be patched before concrete is thoroughly dry. Defective areas to be chipped away to a depth of not less than 40 mm with sawcut edges perpendicular or dovetail to surface. Area to be repaired and a space at least 150 mm wide entirely surrounding it to be wetted to prevent absorption of water from repair mortar.

.4 Cure all repairs thoroughly in accordance with Manufacturer’s instructions.

3.12 DAMP PROOFING AND WATERPROOFING

.1 Preparation of concrete surfaces for damp proofing and waterproofing to conform to CSA A23.1.

.2 Application to conform to Manufacturer's recommendations.

3.13 CONCRETE SPECIALTIES

.1 Provide and install all concrete specialties as shown on Drawings and as necessary to complete concrete work.

.2 Included are fibreboard joints, waterstop, and bond breakers.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for the lift station wet well chamber.

1.2 MATERIALS TESTING

.1 Tests for concrete are specified in Section 03 10 00.

1.3 STANDARDS

.1 Materials supplied in this section shall be in accordance with ASTM and CGSB Standards.

1.4 SHOP DRAWINGS

.1 Submit shop drawings for all cast in place reinforced concrete structures, risers, manholes and miscellaneous metals.

1.5 QUALITY CONTROL

.1 Refer to Section 01000.

Part 2 Products

2.1 CONCRETE

.1 Concrete shall be made with type 50 sulphate resistant cement.

.2 Maximum slump 110 mm, Class 32 MPa.

.3 In freezing weather, provide concrete with a temperature of not less than 10°C, and maintain this temperature for 72 hours.

.4 For reinforced concrete structures refer to Section 03 20 00.

2.2 MORTAR

.1 Mortar shall conform to the following mix:
- .1 1 part cement, type 50 sulphate resistant
- .2 1 part clean sharp sand
- .3 water to provide workability

.2 In freezing weather, heat sand and cement and apply mortar warm. Protect joints from freezing until mortar has set.

.3 Grout to be non-shrink type Master Builders Embeco or approved equivalent alternative.

2.3 LIFT STATION BASE

.1 Precast to ASTM-C76-3 or poured-in-place concrete as detailed in the drawing set.

2.4 WATERPROOFING

.1 Joints of all manhole and lift station components, including top section, barrel sections, and base shall be sealed watertight with a minimum of two (2) 18mm wide strips of butyl rope joint sealant meeting requirements of ASTM C990. Butyl rope joint sealant shall be Conseal ™ CS-202 as manufactured by Concrete Sealants, Inc., EZ-Stik as manufactured by Press-Seal Gasket Corporation, or approved equal.

.2 Crack and Joint Filler: XYPEX "Patch and Plug" and XYPEX "Concentrate", manufactured by XYPEX Chemical Corporation.

.3 Cretex wrap shall be applied to the lift station exterior section joints following barrel installation.

Part 3 Execution

3.1 GENERAL

.1 Excavation for lift station wet wells shall be as specified in the applicable civil sections.

.2 Remove water from excavations prior to placing base concrete.

.3 Over excavate the base if the material at the bottom of the trench is unsuitable for support, and replace with crushed gravel compacted in 150 mm lifts to 95% Standard Proctor Density.

.4 Cast – in – place bases for structure shall be poured on solid, unfrozen ground.

.5 Provide concrete as specified and protect poured concrete to maintain temperature of at least 10°C for the first 72 hours.

.6 Granular base shall be placed on solid unfrozen ground in 150 mm lifts and compacted to 98% Standard Proctor Density.

.7 Bases shall be set level so that lift station barrels can be set plumb.

3.2 LIFT STATION CONSTRUCTION

.1 Lift Station shall be constructed in accordance with details on the drawings.

.2 Set bottom sections plumb on poured or precast bases and fill around with mortar.

.3 Install flexible sealing compound and set manhole sections in place in accordance with the directions of the manufacturer of the sealing compound.

.4 Cover all interior joints with Xypex.

.5 Waterproof all joints.

3.3 XYPEX PREPARATION FOR INTERIOR WET WELL JOINTS

.1 Do not apply in wet weather.

.2 Application temperature 10ºC to 40ºC.

.3 Clean surfaces free of all direct laitance and other foreign materials.

.4 Chip a "U" shaped slot 10mm to 25mm wide and a minimum of 25mm deep. Clean slot thoroughly. Wet well with water and remove all surface water. Apply a slurry coat of XYPEX "Concentrate" at the rate of 0.82 kg/m^2 (1.5 lb/yd^2) to the slot. Allow the slurry to reach an initial set, then fill the slot with XYPEX "Patch and Plug" as per manufacturer's requirements.

.5 For rock pockets, honeycombing or other defective concrete, grout out defective areas to good concrete. Remove all loose materials and saturate well with water. Remove surface water and apply one slurry coat of XYPEX "Concentrate" as directed by the manufacturer. After the slurry has set, but while it is still green, fill cavity to surface with XYPEX "Patch and Plug" as per manufacturer's requirements.

.6 General concrete area shall have an open capillary system to provide tooth and suction and shall be clean; free from scale, excess form oil, laitance, curing compounds and any other foreign matter. Prepare surfaces as required by the manufacturer.

3.4 WATERPROOFING APPLICATION

.1 Apply waterproofing to interior wet well joints and defective concrete in strict accordance with material Manufacturer's specifications.

.2 Wet concrete surfaces as recommended by manufacturer before application of waterproofing.

.3 Allow fog spray, three times per day for three days, to cure waterproofing in accordance with manufacturer's instructions.

.4 Following curing, allow 12 days for waterproofing to set prior to filling wet well.

3.5 CLEAN-UP

.1 Remove dirt, mortar, debris and other material from manholes and lift stations.

.2 Place covers after cleaning.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies requirements for design, supply, fabrication, finishing, and installation of miscellaneous steel items.

1.2 REFERENCES

.1 American Iron and Steel Institute (AISI).

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM A36/A36M-19, Standard Specification for Carbon Structural Steel.
- .2 ASTM A53/A53M-24, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .3 ASTM A108-24, Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished.
- .4 ASTM A123/A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .5 ASTM A153/A1532M-23, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .6 ASTM A240/A240M-24b, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .7 ASTM A209-03 (2022), Standard Specification for Seamless Carbon-Molybdenum Alloy-Steel Boiler and Superheater Tubes.
- .8 ASTM A307-21, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
- .9 ASTM A563/A563M-24, Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).
- .10 ASTM A780/A780M-20, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
- .11 ASTM B221-21, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .12 ASTM B632/B632M-24, Standard Specification for Aluminum-Alloy Rolled Tread Plate.
- .13 ASTM F436/F436M-22, Standard Specification for Hardened Steel Washers Inch and Metric Dimensions.
- .14 ASTM F1554-20, Standard Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength.
- .15 ASTM F3125/F3125M-15a, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, Metric Dimensions, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength.

.3 Canadian General Standards Board (CGSB):
- .1 CAN/CGSB-1.181, Ready-Mixed, Organic Zinc-Rich Coating.

.4 Canadian Standards Association (CSA):
- .1 CSA S16-19, Design of Steel Structures.
- .2 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
- .3 CSA W48-18, Filler Metals and Allied Materials for Metal Arc Welding.
- .4 CSA W59-18(R2023), Welded Steel Construction.

.5 CSA S157-17/S157.1-17(R2022), Strength design in aluminum / Commentary on CSA S157-17, Strength design in aluminum.

.5 National Building Code of Canada 2015 (NBC).

1.3 DESIGN CRITERIA

.1 Details and specifications are intended to indicate the general character and extent of metal fabrications and do not attempt to indicate all methods of construction.

.2 Fabricate and install metal fabrications to withstand all stresses encountered in normal use. Unless specified or noted otherwise, all imposed live loads shall be in accordance with NBCC code.

1.4 QUALITY ASSURANCE

.1 Employ tradesmen skilled in this trade and proficient in use of various materials specified.

.2 Perform work in accordance with material manufacturer's instructions.

.3 Refer to Section 01000.

1.5 SUBMITTALS

.1 Submit in accordance with Section 01000.

.2 Submit detailed shop drawings for all metal fabrications, showing fabrication and erection details. Design all connections required. Shop drawings to bear seal and signature of a Professional Engineer registered in the Province of Ontario.

.3 Shop drawings: indicate materials, core thickness, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details and accessories. Indicate field measurements on shop drawings.

.4 Submit certificates for materials supplied if requested by Engineer.

.5 Submit details and shop drawings for review by Engineer at least 10 days in advance of fabrication.

1.6 PRODUCT DELIVERY, STORAGE, HANDLING

.1 Deliver items on site in a safe manner.

.2 Deliver items in sufficient quantity to allow continuity of work.

.3 Deliver products to the site in the largest practical sections. Tag and mark items for identification.

.4 Deliver items to be built in adjoining construction at proper time.

.5 Store items on site under cover in positions to ensure that no bending, warping, or marring takes place.

.6 Prevent staining by concrete, mortar, plaster, oil, grease, or other foreign substances.

.7 Do not paint or place crayon or other markings on exposed surfaces.

1.7 JOB CONDITIONS

.1 Give timely and accurate instructions to other trades for locations, levels, holes, connections of anchors, sleeves, and frames.

.2 Examine site conditions and take site measurements to ensure accurate and proper fitting, clear of obstructions.

Part 2 Products

2.1 MATERIALS

.1 Steel sections and plates: to CSA G40.20/G40.21, Grade 300W.

.2 Steel pipe: to ASTM A53/A53M, Type S, Grade B, weight class specified by item, galvanized finish, of sizes indicated.

.3 Steel hollow structural sections: to CSA G40.21 grade 350 W.

.4 Stainless steel plates, sheet and strip: to ASTM A167, Type 316 with AISI No.4 finish unless otherwise indicated.

.5 Welding materials: to CSA W59.

.6 Welding electrodes: to CSA W48 Series.

.7 Bolts and anchor bolts: to ASTM A307.

.8 Epoxy grout: multi-component epoxy grout with high bond strength for anchoring bolts, in concrete and masonry.

.9 Aluminum extruded bars and shapes: ASTM B221, alloy 6061-T6 or 6063-T6 for bearing bars of gratings and shapes and 6061-T6 for grating cross bars.

.10 Aluminum-alloy rolled tread plate: ASTM B632, alloy 6061-T4 for treads and 6061-T6 for platforms; conform to ASTM A209.

2.2 FASTENINGS AND ANCHOR BOLTS

.1 Nuts, bolts, washers, rivets, and screws to be stainless steel: Type 316 ELC.

.2 For structural steel use high strength nuts, bolts, washers, etc.: to ASTM F3125M.

.3 All fasteners submerged in water: stainless steel Type 316 ELC.

.4 For anchors or fastening required to fix equipment after concrete has been poured, use anchorage in accordance with the equipment manufacturer's recommendations.

.5 Provide angles, brackets, inserts, bolts, frames, and all other items required to fasten metalwork to concrete, to metal framing, or other parts of the structure.

2.3 CORROSION PROTECTION

.1 Hot dip galvanize all ferrous metal fixings and miscellaneous parts, including hangers, bolts, nuts and washers.
- .1 Shapes: to ASTM A123M.
- .2 Fasteners: to ASTM A153M.

2.4 GROUT

.1 Use pre-mixed non-shrink non-metallic grout.

2.5 FIBREGLASS REINFORCED PLASTIC (FRP) GRATING

.1 Square mesh 38 mm (1 ½") thick with 38 mm x 38 mm (1 ½" x 1 ½") bar spacing.

.2 Grating to be fixed or hinged in sections as shown on Drawings, not exceeding 24 kg (53 lbs) in weight.

.3 Shop drawings shall include fastening details with sizes, gauges, and centres of fastenings.

.4 Support 72 psf uniform load and max deflection L/100 for a 1200 mm (48") span.

.5 Sections shall be standard sections as manufactured by Nemato Composites, Emco Industrial Plastics, Structural Composite Technologies, or Fabco.

2.6 ALUMINUM HATCHES

.1 Hatches and access frames/panels to be aluminum construction with frames cast in place unless otherwise indicated and dimensions as shown on the drawings. Contractor to complete associated drainage piping for drainage frames. See hatch schedule below.

.2 Portions of aluminum hatches in contact with the concrete to be finished with bituminous coating prior to installation.

Type	Description	Drawings	Product
1	Nondrainage Frame Hatch	D-501	A-post A Series, Bilco Type K, MSU Mississauga Type C, or approved equal

2.7 STAINLESS STEEL LADDERS

.1 Stainless steel access ladders and cases welded construction to CSA W47.1, Type 316 and shall be as detailed on Drawings.

.2 Ladder rungs: Stainless steel Type 316 as detailed on Drawings.

2.8 STEEL CHECKERPLATE

.1 Covers and frames: hot dip galvanized to ASTM A123M.

.2 Checkerplate: raised diamond pattern.

.3 Construct the frames with steel structural angles or channels, mitred at the corners, complete with anchor lugs, and flat surround. Fit covers with lifting handles, padlock, shackle, and limit chain.

.4 Design tread plates for loads and limitation of deflection as specified for steel grating.

.5 Design loads as per the Drawings.

.6 Minimum thickness 6 mm not including raised diamond lugs.

2.9 SAFETY CHAINS

.1 Removable 5 mm proof chain 13 mm x 29 mm center to center oval shaped 316 SS stainless steel links, snaphooks, and eyes unless noted otherwise.

2.10 LIFTING HOOKS AND RAIL SUPPORTS

.1 According to details on Drawings.

.2 Hot dip galvanized steel construction to ASTM A123M and ASTM A153M.

.3 Submit shop drawings.

2.11 ALUMINUM HAND HOLD

.1 An aluminum hand hold shall provide safe access into and egress from the station.

.2 Aluminum welded construction to CSA S157, Alloy Type 6061-T6 and shall be as detailed on the drawings.

.3 Hand hold construction and its supports shall meet all safety requirements of the Worker's Compensation Board and safety codes of the local area.

2.12 FABRICATION

.1 Fabricate work square, true, straight, and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.

.3 Where possible fit work and shop assemble ready for erection.

.4 Ensure exposed welds are continuous and smooth for length of each joint; file or grind exposed welds smooth and flush as required.

.5 Remove and grind smooth burrs, filings, sharp protrusions, and other projections from metal fabrications to prevent possible injury. Correct dangerous or potentially harmful installations.

2.13 FINISHES

.1 Galvanizing: hot dipped galvanizing to ASTM A123M for shapes and ASTM A153 for fasteners.

.2 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

2.14 ALL OTHER MISCELLANEOUS

.1 All other miscellaneous items as shown on Drawings shall be hot dip galvanized steel unless otherwise specified or shown.

Part 3 Execution

3.1 ERECTION

.1 Do steel welding work in accordance with CSA W47 & W59 unless specified otherwise.

.2 Erect metalwork in accordance with reviewed shop drawings, square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Engineer such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Secure wall mounted items securely and rigidly in place as follows:
- .1 Stud walls: screws into solid backing. Do not use toggle bolts for stud walls.
- .2 Hollow masonry: toggle bolts.
- .3 Solid masonry, concrete, and stone: bolts and expansion anchors.

.5 Grout under base plates with non-shrink gout.

.6 Exposed fastening devices to match finish and be compatible with material through which they pass.

.7 Provide components for building by other sections in accordance with shop drawings and schedule.

.8 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.9 Make field connections with bolts or welds to CSA S16.

.10 Ensure exposed welds are continuous and smooth for length of each joint; file or grind exposed welds smooth and flush as required.

.11 Touch-up rivets, field welds, bolts, and burnt or scratched surfaces after completion of erection with primer.

.12 Touch-up galvanized surfaces with zinc primer where burned by field welding.

3.2 PIT COVERS AND FRAMES

.1 Set top of frame flush with adjacent concrete surface.

.2 Install covers.

3.3 INSPECTION

.1 Notify Engineer to allow inspection of fit, welding, bolting, and other items.

.2 Take field measurements as necessary to ensure proper fit of miscellaneous metal items into structures.

3.4 FABRICATION

.1 Perform steel welding according to CSA W47 & W59.

.2 Trim and bevel ends and other items to enable satisfactory welding.

.3 Keep painting back from areas requiring welding after fabrication.

3.5 FINISHING

.1 Apply touch up paint for galvanized metal.

.2 Clean and touch up shop primer after installation.

.3 Painting for finishing details: refer to Section 09 90 00.

3.6 FASTENING AND ANCHORING

.1 Cast anchor bolts in concrete as shown on Drawings.

.2 Do not use self-drilling anchors where cast-in anchor bolts are specified.

3.7 CHECKERPLATE

.1 Provide checkerplate covers and frames where shown on Drawings.

.2 Frames to consist of angle mitred at corners, complete with anchors and packing bars. Covers to be fitted with lifting handles and neoprene gaskets.

3.8 REMOVABLE SAFETY CHAINS

.1 Removable safety chains shall be complete with approved snap hooks fastened at each end to posts, all in stainless steel 316.

.2 Provide 20 mm diameter eyes fixed on posts.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 This section specifies requirements for fall arrest safety equipment, and WHMIS hazard signs.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01000.

.2 Shop drawings/product data:

.1 Submit shop drawings or manufacturer's product data sheets for all items.

.2 Indicate manufacturer, product description or model/catalogue numbers, sizes, quantities, materials and finishes, accessories, options and installation details. Indicate requirements for related work.

1.3 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals in accordance with Section 01000

.2 Maintenance data: submit operation and maintenance data for each specified item for incorporation into maintenance manual.

.3 Spare parts: provide spare parts and extra materials as specified by items.

.4 Warranties: submit manufacturer's warranties. All warranties shall be on the manufacturer's letterhead.

Part 2 Products

2.1 FALL ARREST EQUIPMENT

.1 Davit Socket – flush mount floor socket, hot dip galvanized. Miller DH-20ZP, Tuff Built 30043, or approved equal. Provide sleeve cap.

.2 Fall Arrest Davit Arm, adjustable 300mm-750mm offset mast with adjustable mast height from 1.88m-2.26m. Miller Durahoist DH-3, Tuff Built Davit 28R-84H or approved equal.

.3 Provide two (2) safety harnesses, full body, max. working load of 181.4 kg (400 lbs). Safety harness to meet CSA Z359.1. Miller 650T-4/UGK or approved equal.

.4 Provide one (1) self-retracting lifeline to CSA Z259.2.2-14, Miller MightyLite RL30G-Z7, Tuff Built 60063 or approved equal.

.5 Provide two (2) shock absorbers limiting 6 foot free fall force load to 900 lb_f (approx. 409 kg_f).

Part 3 Execution

3.1 PREPARATION

.1 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Fit exposed connections accurately together to form tight joints. For all connections ensure final connections are secure and confirmed.

.3 Perform cutting, and fitting required for installation of walkways and guardrails. Set walkways and guardrails accurately in location, alignment, and elevation, measured from established lines and levels.

3.3 PROTECTION

.1 Protect installed products until completion of project.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

Part 1 General

1.1 DESCRIPTION OF WORK

.1 The Contractor shall furnish all labour, materials, equipment, and incidentals necessary to supply and install all manufactured specialties as shown, specified and required to complete the work of this Contract.

1.2 RELATED WORK

.1 Division 03.

1.3 SUBMITTALS

.1 Submit in accordance with Section 01000.

.2 Shop drawings/product data:

.1 Submit shop drawings or manufacturer's product data sheets for all items.

.2 Indicate manufacturer, product description or model/catalogue numbers, sizes, quantities, materials and finishes, accessories, options and installation details. Indicate requirements for related work.

.3 Samples:

.1 Submit samples for individual products as specified in this section.

.2 Submit samples for items requiring color selection by Engineer. Submit two (2) representative samples indicating manufacturer's full colour range for colour selection by Engineer.

.4 Submit manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

.1 Submit closeout submittals in accordance with Section 01000.

.2 Maintenance data: submit operation and maintenance data for each specified item for incorporation into maintenance manual.

.3 Spare parts: provide spare parts and extra materials as specified by items.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01000.

.2 Submit shop drawings or catalogue illustrations of all items. Clearly indicate model numbers, sizes, quantities, locations, finishes, optional features. Indicate mounting and installation details, anchorage, fasteners and relationship to building components.

1.6 WARRANTIES

.1 Warranties shall be in accordance with the General Conditions for each item. All warranties shall be on the manufacturer's letterhead.

1.7 SITE CONDITIONS

.1 Verify all site dimensions prior to fabrication. Indicate site dimensions on shop drawing.

1.8 MAINTENANCE DATA

.1 Submit operating instructions and maintenance data for miscellaneous items for incorporation into Operating and Maintenance Manual specified in Section 01000.

Part 2 Products

2.1 HAZARD SIGNS

.1 Confined Space Entry Signs

.1 Provide confined entry signs to be fixed to the access hatches for the lift station wet well. The signs shall have the following characteristics:

.1 Signs to be 4 mm Aluminum

.2 Letters and border to be black, sign to be yellow.

.3 Dimensions to be 200 mm x 250 mm

.4 Signs to read “Confined Space Entry”

Part 3 Execution

3.1 MANUFACTURER’S INSTRUCTIONS

.1 Compliance: comply with manufacturer’s written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 SITE VERIFICATION

.1 Verify all dimensions on site prior to fabrication. Fabricate items in accordance with sizes, profiles, finishes required and indicated.

3.3 INSTALLATION

.1 Install and secure items rigidly in place in accordance with reviewed shop drawings and manufacturers printed instructions and templates, except where indicated otherwise.

.2 Coordinate installation of anchors, brackets and hangers with work of other trades.

.3 File smooth or burr smooth exposed share edges and corners.

.4 Install and secure fixtures rigidly in place as follows:

.1 Stud walls: screws in solid backing. Toggle bolts not acceptable.

.2 Solid concrete: bolts and expansion anchors.

.5 Install equipment as per manufacturer’s recommendations.

3.4 ADJUSTMENT AND CLEANING

.1 At completion of installation test and adjust specialties for proper function.

.2 Clean materials of dust, dirt and other markings using cleaning agents recommended by manufacturer. Clean and polish glass, chrome and other bright polished or glossy surfaces.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All Sections of all Divisions of the Specifications and these Documents inclusive form part of the Contract Documents.

.4 All Control system drawings shall be sealed by a Professional Engineer registered in the province having jurisdiction in the location of the installation.

1.2 DESCRIPTION

.1 This section specifies the General Provisions for the supply, delivery, installation, calibration and commissioning of the process control and instrumentation system.

.2 The Contractor shall apply suitable expertise to bid and provide a complete and fully operating automation system. Include facilities and services to meet the requirements described or implied herein. Include full integration of all components of the work.

.3 The Contractor shall allow for components and wiring necessary to interface systems.

.4 The Contractor shall finalize details of design.

.5 The work to be done shall include the provision of all labour, materials, tools and equipment as well as the application of a competent knowledge of construction, whether or not directly specified or shown on the plans, required for the installation testing and placing into service the complete control and instrumentation system, except when it is specifically mentioned that certain materials and/or labour are not part of the contract.

.6 These specifications shall apply to and govern all trades doing control and instrumentation work and shall be read in conjunction with and form a part of the general specifications of the project.

.7 The Control and Instrumentation work includes but is not limited to the following:

- .1 Control panel.
- .2 Provide process automation. Refer to design drawings and shop drawings for additional information.
- .3 Intelligent Pump Station Manager MultiSmart (PBN)
- .4 Program PBN
- .5 Primary elements for the measurement of flow, level, pressure, temperature, etc.
- .6 Indicators and annunciators.
- .7 Uninterruptible power supplies (UPS) or backup batteries.
- .8 Communication systems.
- .9 Spare Parts & Manuals.

.8 The Integrator shall coordinate with Contractors and equipment vendors to determine the functionality, wiring, and sequences for all equipment, and any required hardware or programming to support any equipment. Carry out this exercise at the shop drawing stage of the project. Assist other trades to make their shop drawings complete, coordinated, and suitable for a proper functional implementation of the works, prior to submission of shop drawings. Incorporate results from this coordination into Integrator's own shop drawings, prior to submission. Shop drawings from the various trades are to be coordinated, in agreement, and whole. This coordination is to cover all works, including but not limited to,

.1 Instrumentation.

.2 Automation.

.3 Field devices.

.4 Control panels.

.9 The Electrical, and Process Drawings and these Specifications are complementary to each other and each form a part of the contract. In the event of discrepancies between Drawings and Specifications, the more restrictive conditions of the two shall apply, unless a written clarification is obtained from the Consultant.

.10 Coordinate all work with other trades on the job, such that a complete functioning system can be supplied as shown on the Drawings and Specifications for this project, and there is no disruption to the other trades on the project.

1.3 RELATED WORK

.1 Review all specifications and include all works indicated or implied.

.2 Review drawings of all disciplines and include all works indicated or implied.

.3 Section 01000.

.4 Electrical - Division 26

1.4 SUBMITTALS

.1 Information packages submitted for review and/or approval shall include:

.1 An index page.

.2 Have component items identified with the Specification Section and equipment tag from the equipment and/or instrument list.

.3 Where manufacturers' information, catalog, cut-sheet, or brochure information is used, which list more than one style or member of a family or options, the actual component or item being supplied shall be clearly highlighted.

1.5 EXAMINATION OF DRAWINGS

.1 The electrical drawings do not show all mechanical and structural details. All electrical schematics are shown diagrammatically unless otherwise noted. The Contractor shall review the mechanical, structural and process drawings to obtain details. Verify dimensions accurately by measurements.

.2 To change the location of control equipment, submit a request in writing to the Engineer for approval. If approved, such changes are to be made at no additional cost to the Owner.

.3 No extra will be allowed for any additional labour or materials required for relocation of equipment due to interference with equipment of other trades, beams, joists, walls, etc., unless the conflict has been submitted to the Engineer in writing before closing of tenders.

1.6 EQUIPMENT MANUFACTURERS

.1 All equipment shall be manufactured by experienced manufacturers who can demonstrate in-use records for all equipment offered.

.2 Requests for approval of alternative suppliers shall be submitted to the Engineer. Refer to Section 01000.

.3 Equipment of a given nature shall be supplied by a single manufacturer and a single vendor, to an extent reasonably practicable. This is to simplify training, as well as servicing, maintenance, and spare parts, and for a consistent visual appearance.

1.7 CODES, PERMITS AND FEES

.1 The work shall comply with the requirements of the current edition of the Electrical Code, and all local provincial and municipal rules, laws and ordinances pertaining to the work.

.2 Obtain the required construction permits, arrange for inspections and supply the Engineer with approval certificates pertaining thereto including a certificate of final inspection.

1.8 REFERENCE STANDARDS

.1 Unless otherwise specified, equipment shall conform to appropriate standards and recommendations of:

.1 The American Society of Mechanical Engineers, hereinafter referred to as ASME Standards.

.2 The International Society of Automation, hereinafter referred to as ISA.

.3 The Canadian Standards Association, hereinafter referred to as CSA.

.2 All equipment shall be metric - SI Standard.

1.9 MANUALS

.1 Refer to Section 01000.

.2 Provide operating, maintenance brochures and electrical wiring for all equipment and arrange for their insertion into the Operation and Maintenance Manuals. The information shall include all applicable, descriptive and technical data, maintenance and operating procedures, wiring diagrams, spare parts lists, service representatives, and suppliers for replacement parts. The information shall be neatly and orderly assembled in binders.

.3 Provide training manual specific to the facility. Training manual to contain screen captures of all Multismart screens and pop-ups, along with text describing the system operation and user interface as it relates to each screen.

1.10 COORDINATION OF WORK

.1 Cooperate and coordinate with other trades on the project.

.2 Make suitable arrangements with other trades to make provision for the control and instrumentation work and be responsible for the assurance that such provisions are satisfactory for the control and instrumentation work.

.3 Check drawings and specifications of other trades for coordination with the control and instrumentation trade. If any conflicts are found, contact Engineer with a description of issues and any proposed solutions before proceeding.

1.11 DRAWINGS AND MEASUREMENTS

.1 Drawings are generally diagrammatic, are intended to indicate the scope and general arrangement of work and are not detailed installation drawings. Do not scale the drawings.

.2 Consult the process layouts and architectural drawings and details for exact locations of fixtures and equipment. Obtain this information from the Consultant where definite locations are not indicated.

.3 Take field measurements, where equipment and material dimensions are dependent upon building dimensions.

1.12 SHOP DRAWINGS

.1 Refer to Section 01000.

.2 Provide network drawings, layout drawings of instrument and control panels, schematic diagrams and detailed loop drawings of all devices listed in the instrumentation data sheets and any equipment connected to the control and SCADA systems. The Contract Administrator review of shop drawings shall be for general arrangement only and shall not relieve the Contractor from responsibility for errors, proper fitting, construction of the work, and furnishing of materials.

.3 Control drawings shall be updated as the work progresses and shall be submitted to the Engineer as Drawings of Record when the work is completed.

.4 All control drawings, panel layout drawings, and schematic drawings, and PLC programs shall be sealed by a Professional Engineer in good standing with, and registered with, the provincial Professional Engineering Association in the jurisdiction in which the site work is to be performed.

.5 Submit shop drawings for the following items:

- .1 Control Panels
- .2 Panel layout drawings
- .3 Loop drawings for all items connected to the control system
- .4 Loop drawings to indicate instrument ranges and settings
- .5 Individual loop drawings required for each loop – typical loop drawings that apply to multiple devices will not be permitted.
- .6 Panel wiring schematics and interconnection drawings
- .7 Field instruments
- .8 Power supplies

1.13 MAINTENANCE SECTION

.1 General:

.1 Summarize data for this section from Contractor supplied maintenance submissions, supplemented by any additional appropriate data.

.2 Include maintenance as a section of each system.

.3 Organize data into sections, with divider tabs as follows:

.1 Maintenance Tasks and Schedules

.2 Spare Parts

.3 Suppliers and Contractors

.4 Tags and Directories

.5 Maintenance Brochures

.2 Maintenance Task and Schedules:

.1 Organize data according to system category, with further breakdown into individual systems. Provide section index and divider tabs for each system category. Summarize maintenance tasks from maintenance manufacturer's brochures, for each component of system in following format:

.1 Daily

.2 Weekly

.3 Monthly

.4 Semiannually

.5 Annually

.6 When required

.3 Spare Parts List:

.1 Organize data according to system category, with further breakdown into individual systems. Provide section index and divider tabs for each system category. Summarize maintenance tasks from maintenance manufacturer's brochures, for each component of system.

.4 Suppliers and Contractors List:

.1 Provide summary of suppliers and contractors for each component of the system. List name, address and telephone number of each.

.5 Maintenance Brochures:

.1 Include copies of all manufacturers' printed maintenance brochures pertaining to each product, equipment or system. Provide section index and divider tabs. Maximum of twenty-five sheets or one brochure per tab.

1.14 DRAWINGS OF RECORD

.1 Refer to Section 01000.

.2 Submit all control drawings.

1.15 AS-BUILT DOCUMENTATION

.1 As work progresses, record on one (1) set of contract drawings, any change to conduit or layout as well as any approved changes and deviations from the original contract and/or working drawings recorded in red. At completion of work, submit to the Contract Administrator one clean mark-up set. Refer to section 26 05 00 for details.

.2 In addition to the as-built contract drawings, submit as-built documentation for inclusion in the Maintenance Manuals as outlined in clause 1.8 above.

.3 Provide as-built Multismart programming hard copy and back-ups (2 copies) on USB flash drive to the Engineer.

.4 No final contract payment shall be made until all digital as-built documentation has been accepted by the Engineer.

1.16 WARRANTY

.1 Warranty system assembly, installation, hardware, software, and communications operations for all parts and labour for a period of one year from date of project total performance.

Part 2 Products

2.1 MATERIALS

.1 All materials shall be new and the best of their respective kind.

.2 All materials shall bear the approval of the Canadian Standards Association (CSA) or cUL unless otherwise noted.

.3 All materials shall be suitable for full operation within, unless otherwise noted:

.1 Outdoor : NEMA 3R

.2 Category 1 only areas: NEMA 4 or as indicated,

.3 Category 2 areas: NEMA 4X or as indicated.

.4 Zone 2: Corrosive resistance Class 1 Div1 or Zone 1

.4 See subsequent clauses for specific equipment and instrument specifications.

2.2 POWER SUPPLY

.1 Provide all necessary power supplies for controls and instruments.

.2 Power wiring to field devices shall be minimum #14 AWG.

2.3 CONTROL WIRING

.1 Unless specified otherwise, all conductors for control wiring inside the control panel shall be copper with TEW 105, X-link insulation, insulation voltage to be suitable for the highest voltage to which the conductors may be exposed.

.2 Colours:

.1 Neutral conductors shall be white

.2 Grounding conductors shall be green

.3 DC conductors shall be blue

.4 AC conductors shall be red.

.3 Control wiring for digital functions shall be 16 AWG ACIC Instrumentation Cables minimum with 600 Volt insulation.

.4 Control wiring for analog functions shall be 16 AWG ACIC Instrumentation Cables minimum with 600 Volts insulation, individual and overall twisted and shielded, 2 or 3 wire to match analog function hardware.

.5 Multi-Conductor Cables are preferred when it applicable

.6 Where dimensional details are required, work with the applicable structural and architectural drawings.

.7 The Contractor is responsible for correcting any work completed contrary to the intent of the drawings and specification and shall bear all costs for correcting same.

2.4 CONDUIT, WIRING AND CABLE

.1 Supply and install all conduits, wiring, control and instrumentation cables for the control, instrumentation, and low line voltage control for building services.

.2 Conduit and wiring for power, lighting, miscellaneous electrical systems, power supplies to control instrumentation fed from panels panels including other components requiring line voltage power supply shall be supplied and installed as specified in Division 26 - Electrical.

Part 3 Execution

3.1 INSTALLATION

.1 Install and interconnect all process control system equipment and components as indicated.

.2 Install all equipment in accordance with the manufacturer’s recommendations and in a manner that will ensure satisfactory operation upon completion.

.3 Provide all labour and all necessary equipment including timbers, scaffolding, tools and rigging materials for installation of the equipment.

.4 Contractor shall be responsible for coordinating all mechanical, electrical and other works for the equipment being installed.

.5 Installation shall meet the minimum standards set forth by Standards and Practices for Instrumentation, Tenth Edition - 1989.

.6 Use trained personnel to install systems and controls as per approved shop drawings and in accordance with manufacturer's recommendations.

.7 Follow building lines with all piping and electrical wiring runs. Utilize proper separation and wiring techniques.

3.2 TESTING

.1 Thoroughly test all control equipment, components, and systems for proper operation and report in writing to the satisfaction of the Engineer.

.2 Tests shall include:

.1 Complete operational test including interlocks, functions, features, options, etc., for all instrumentation, PLC, and computer system control operations.

.2 Operation of alarm initiating devices.

.3 Calibration of all instruments.

.3 Supply all necessary test equipment and personnel to completely test the entire instrumentation and process control system.

3.3 START-UP AND COMMISSIONING

.1 Upon completion of the installation, the Contractor shall be responsible for testing to determine correct system operation and sequences as intended in the Contract Documents. Process Instruments such as flow, level, pressure transmitters, etc., shall be checked for operation prior to process start-up, by manipulating operating controls like set points, auto-manual selectors, etc. Status and alarm contacts to be checked by manipulation or jumpering at the sensing element.

.2 Check sheets for all instrumentation and PLC I/O to be filled out during the commissioning process and submitted to the Engineer.

.3 Results of tests are to be logged by the Contractor and submitted to the Engineer. Any apparent defects shall be reported and corrected.

.4 When preliminary checks have been completed and process equipment is operating or ready to operate, individual systems shall be calibrated in accordance with the latest ISA recommendation.

.5 After calibration and upon submittal of all PLC I/O and instrumentation check sheets the system shall be placed in operation in conjunction with the Engineer and/or the Owner's designated operating personnel.

.6 Refer to Section 01000.

3.4 SPARE PARTS

.1 The Contractor shall provide the following spare parts:

.1 Two (2) plug-in control relays of each type and coil-voltage used complete with base.

.2 Two (2) plug-in time delay relays of each type and coil-voltage used complete with base.

.3 One (1) package of twenty fuses of each type and ampacity used.

.4 Five (5) indicating lights of each type, voltage, and colour used.

.5 One (1) push button assembly including contact blocks of each type used.

.6 One (1) selector switch assembly including contact blocks of each type used.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All Sections of all Divisions of the Specifications and these Documents inclusive form part of the Contract Documents

1.2 SCOPE

.1 This section covers the supply and installation of all field located motor control stations and control panels.

1.3 QUALITY ASSURANCE

.1 CSA C22.2 No. 14-13 Industrial Control Equipment

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 25 05 00 and include schematic, wiring diagrams, and mounting information.

.2 Provide preventive maintenance program for the control panels and communication equipment

Part 2 Products

2.1 ENCLOSURES

.1 All enclosures and devices shall be rated NEMA 3R for outdoor environments, NEMA 4X for wet and corrosive environments, and Class I Div I for hazardous locations.

2.2 PUSHBUTTONS

.1 Heavy duty oiltight, operator flush, black, with 1-NO and 1-NC contacts rated at 10 A, 120Vac, labels as indicated. Stop pushbuttons coloured red, provision for padlocking in depressed position.

.2 Acceptable manufacturer(s): Allen-Bradley, Telemecanique, Siemens Class 52.

2.3 INDICATING LIGHTS

.1 Heavy duty Oiltight, push to test LED type, lens colour as indicated, supply voltage: as required, labels as indicated.

.2 Acceptable manufacturer(s): Allen-Bradley, Telemecanique, Siemens Class 52.

2.4 SELECTOR SWITCHES

.1 Number of positions as required, labelled as indicated, heavy duty oiltight, operators as indicated, contact arrangement as indicated, rated 120Vac, 10 A.

.2 Acceptable manufacturer(s): Allen-Bradley, Telemecanique, Siemens Class 52.

2.5 CONTROL RELAYS

.1 Number of poles as required, must be double throw type (Form C).

.2 Removable relay cube from base

.3 Acceptable manufacturer(s): Allen-Bradley, Omron, Carlo Gavazzi, Siemens Sirius

2.6 PANEL MOUNTED ALARMS

.1 Supply panel mounted alarms, as indicated, with the following features:

- .1 NEMA 4X.
- .2 60 to 80 dBa (at 2 ft.).
- .3 Continuous tone.
- .4 24Vdc supply.
- .5 CSA, cUL, or ETL certified.

.2 Acceptable manufacturer(s): Sonalert SC628 series, or approved equal.

2.7 ALARM BEACONS

.1 Supply beacons for general alarm indication, as indicated, with the following features:

- .1 NEMA 3R, 4, or 4X
- .2 Colors – See Instrument List
- .3 Flashing LED
- .4 24VDC /120VAC supply.
- .5 Rated for Outdoor Application c/w UV stabilized material
- .6 Operating Conditions -40 °C to 50 °C (For outdoor installation)
- .7 Quick Disconnect type
- .8 CSA, cUL, or ETL certified.

.2 Supply panel, wall, or conduit mounting brackets to suit installation

.3 Acceptable manufacturer(s):

Process area or single outdoor light – Edwards Signal 48XBRM Series c/w wall mounted brackets or approved equal

2.8 GENERAL ALARM BUZZERS

.1 Supply beacons for general alarm indication, as indicated, with the following features:

- .1 NEMA 3R, 4, or 4X
- .2 120Vac supply.
- .3 Wall mount.

.4 Sustained tone.

.5 110 dBa at 1 metre.

.6 External volume adjustment, without removal of the cover and without unmounting the unit.

.2 Supply panel, wall, or conduit mounting accessories to suit installation as indicated.

.3 Acceptable manufacturer(s): Federal Signal 350WB-120 or approved equal.

2.9 DC POWER SUPPLIES

.1 Where DC power sources are required, each shall be a system comprised of:

.1 Two identical supplies.

.2 Each supply shall be able to supply at least 150% of the connected load.

.3 Paralleling rated.

.4 Each supply connected to one input of a redundancy module.

.5 Redundancy module to have at least one status output to be monitored by the SCADA system. Output shall indicate the status of redundancy.

.6 Power supplies and redundancy modules all to be from the same manufacturer, and from the same product family from that manufacturer.

.2 Acceptable manufacturer(s): Weidmuller PRO-Top family, Phoenix Contact TRIO family, Allen-Bradley or Siemens Sitop.

2.10 TERMINALS

.1 Provide tension clamp terminals.

.1 Number indicated plus 20% spare

.2 Terminals to be rated for connected load.

.3 Fused Terminals shall be supplied with indication light

.4 Double stack terminals will not be permitted unless written approval is obtained from the Engineer.

.5 Acceptable manufacturer(s):

.1 Weidmuller - Z tension clamp.

.2 Phoenix Contact - CLIPLINE ST spring-cage.

2.11 PANEL INTERIOR LIGHT

.1 120Vac supply.

.2 Comes with fluorescent or LED light source.

.3 Equipped with a diffuser to protect the light source.

.4 Switch: Integral or door-actuated.

.5 Width: Spans 75% or more of the width of the roof of the panel.

.6 Acceptable manufacturer(s): Hammond, Hoffman, or approved equal.

2.12 TRANSIENT VOLTAGE SURGE SUPPRESSOR – CONTROL POWER

.1 UL1449 2nd Edition rated using metal oxide varisters.

.2 120 V, 15 A or 30A (as needed), 2 wire grounded input.

.3 MCOV: 150 V.

.4 Surge Current: 50 kAIC per phase.

.5 3 modes of protection.

.6 Filtering Bandwidth: 10 kHz to 100 MHz.

.7 Noise Attenuation: Normal Mode 75 dB at 100 kHz, Common mode 50 dB at 5 Mhz.

.8 Minimum Let Through voltage: 6 V A3 ringwave, 9.6 V B3 Ringwave, 70 V, B3/C1 impulse.

.9 Alarm contact

.10 Manufacturer: Total Protection Solutions, Leviton, Eaton, Siemens TPS, Schneider or approved equal in accordance with B7.

2.13 INDUSTRIAL ETHERNET SWITCHES

.1 General

- .1 Provide Industrial Ethernet switches for network communications.
- .2 The copper ports shall be 8P8C-style.
- .3 The fiber ports, where indicated, shall:
  - .1 Be ST-style
  - .2 Employ a single RX and a single TX transmission structure
- .4 The Ethernet switches shall support at least 100BASE-TX data rates on all ports.
- .5 Ethernet switches have at least sufficient ports to connect all communicating equipment indicated, plus one programming access port, plus 20% spare ports.
- .6 Acceptable manufacturer(s): Red lion, Allen-Bradley, Weidmuller, Phoenix Contact, Siemens Scalence or approved equal.

2.14 POWER DISTRIBUTION PANEL

.1 Provide one (1) power distribution panel for sewage lift station as noted on the drawings

.2 Control Panel shall be as indicated on the electrical drawings and c/w the following equipment:

- .1 Wall mounted Metering Socket
- .2 Main breaker service entrance rated
- .3 Manual Transfer Switch
- .4 Circuit breakers
- .5 Surge protection device (SPD)
- .6 Mobile Generator Receptacle

2.15 SEWAGE LIFT STATION CONTROL PANEL

.1 Provide one (1) control panels for sewage lift station. Control Panels to be designed by Lift Station pump supplier and include following items.

.2 Provide Flygtcloud SCADA service. Cellular SIM cards and data plans shall be supplied as part of the service

.3 Preliminary Control Panel design is indicated on the electrical drawings and c/w the following equipment:

- .1 NEMA 4X rated outdoor insulated, dead-front enclosure, 10 gauge, hinged lockable doors, c/w meter guard. Provide interior door for panel door mounted components such as indicating lights, displays, operator selector switches, etc. Panel finish shall be white epoxy paint for interior and ASA 61 light grey enamel for exterior
- .2 Main disconnect switch.
- .3 Pump controller shall be Xylem MultiSmart (PBN)
- .4 Motor Starters or Motor Protection Circuit Breakers
- .5 Splitter Block
- .6 Pump Hour meters - mounted on interior door.
- .7 SPD
- .8 CT’s for Current Monitoring
- .9 GFI duplex receptacle
- .10 Cellular getaway c/w antenna and surge arrestors
- .11 Intrinsic Safe Relays for floats
- .12 Panel heater c/w thermostat, sized appropriately based on Outdoor Air Temperature of -40 °C
- .13 24VDC power supply c/w redundant battery.
- .14 Circuit breakers as required.
- .15 Lamacoid identification nameplates on all components.
- .16 Terminal strips (identified) for all wiring.
- .17 Panel Light
- .18 Drawing Pocket
- .19 Red Alarm Beacon
- .20 The manufacturer of the control panel shall be a vendor approved by Xylem and familiar with the requirements of specification 253001.

2.16 GROUNDING

.1 Provided grounding lug, suitable for termination of 6AWG to 2/0 AWG copper grounding cable.

.2 Separate grounding bars are to be provided for power grounds and instrument control system grounds (signal cable grounding, etc.).

2.17 GENERAL

.1 Supply the control panels in accordance with the general arrangement and dimensions indicated on the appropriate drawings. Panels must be complete with all instruments, meters, switches, indication lights, relays, etc., as specified herein or as indicated.

.2 Provide removable lamacoid nameplates having letters not smaller than 6 mm to identify equipment.

2.18 CONSTRUCTION

.1 NEMA construction standards, to the Types described in Section 2.1 above, for all panels unless otherwise specified.

.2 Unless otherwise specified fabricate floor mounted panels, indicated, of high grade, cold rolled smooth sheet metal steel no thinner than 3 mm thick with all doors and edges neatly turned and finished smoothly. Visible welding seams will not be accepted.

.3 Construct rigid panels and racks with an angle iron or channel supporting frame, suitably braced and stiffened to prevent any deformation during shipping or installation, and provide a surface free from dents, warping or other deformation. Provide a four-sided channel iron mounting base with front recess.

.4 Provide flush fitting, gasketed, doors hung on piano type hinges with three-point latches and locking-type handles.

.5 Provide pans and rails for mounting terminal blocks, relays, wiring and other necessary devices.

.6 Use rear connected fittings to hold equipment and instrument cases on the panel, but where not possible; any front fixing that is required shall be only by means of chrome-plated, brass or stainless steel machine screws.

.7 Panel surfaces shall be thoroughly cleaned and degreased before painting. One primer coat shall be covered by two finished paint coats.

.8 The surface finish shall be free of runs, drops, ridges, waves and laps. The paints shall be applied in such manner as to provide an even film covering corners and crevices. The interior finish shall be white and the exterior finished will be selected after award of the contract.

.9 Panel Accessories: a pocket, 250 mm wide x 150 mm high x 25 mm deep, to hold pertinent drawings and manuals on the lower half of the inside door.

2.19 INTERNAL WORKS

.1 Provide an individual switch for disconnection and a fuse for isolation of all panel mounted instruments requiring a 120-volt supply.

.2 Make all wiring connections in the shop from the equipment mounted on the panel to numbered terminal blocks conveniently located in the panel, including the power supply for all instruments. Conductors shall be extra flexible stranded copper of gauges sufficient to carry the required currents, and shall in no case be smaller than #16 AWG extra flexible.

.3 Identify all wiring by means of plastic slip-on type or thermally printed heat-shrink type markers. Install all wiring neatly and laced or bunched into cable form using plastic wire clips, and where practical, contained in plastic wiring channels with covers.

.4 Each terminal shall be clearly indelibly marked with the wire number connection to it. Each field connecting conductor shall be served by one terminal. Provide 20% spare unit terminals. Provide all necessary terminal block accessories such as manufactured jumpers and marking tape.

.5 Wire all spare PLC-card I/O points to terminals. These spare points are to remain grouped with the other points from their respective cards.

.6 Mount all internally mounted equipment on DIN rail or mount on a rack and arrange for ease of access and removal when necessary.

.7 Arrange all terminal blocks in the panel in groups such that all low level signals such as 4-20mA DC are located in one area, followed by contact closure type signals (limit switches, etc.), that do not subsequently energize starters, etc. but are for status indication, and the remainder that contain powered circuits, are to be arranged in such a manner and location so as to prevent interference into the low level signal.

.8 Submit proposed terminal block layout and identification scheme for review prior to manufacture.

.9 Provide suitable spaces around the terminal blocks for incoming and outgoing conductors or cable assemblies, with a minimum space of 5cm between terminals and wire trough.

.10 Where the panel has been designed to allow cable entry through the top of the panel, provide a minimum of 15cm space from the panel's top inner surface to the upper face of the wire trough to allow for cable bends, dressing and labelling.

.11 Where the panel has been designed to allow cable entry through the bottom of the panel, provide a minimum of 15cm space from the panel's bottom inner surface to the lower face of the wire trough to allow for cable bends, dressing and labelling.

.12 Provide plastic cable troughs equal to Panduit complete with snap-on covers for containing the cables. Cables are not to be bunched and tied, but laid in.

2.20 PANEL MANUFACTURER

.1 Panel assembly, subcomponents and all internal components shall be CSA approved. Cabinet construction shall be performed by an established panel manufacturer who shall comply with all building codes, factory, and Department of Labour regulations and has CSA approval as a manufacturer for all components of the work including control panels, service entrance, etc. Panels, components, or any items delivered without CSA approval, without prior explicit written consent of the Engineer, will not be accepted.

.2 Panel manufacturing shall be by the System Integrator: Indus Automation, Manco Control System, or Celco Automation.

2.21 SPARE PARTS

.1 As specified in Section 25 05 00 – Common Work Results – Integrated Automation.

Part 3 Execution

3.1 INSTALLATION

.1 Install pushbutton stations, control and relay panels, control devices as indicated, and interconnect as indicated.

3.2 TESTS

.1 Perform tests in accordance with Sections 25 05 00 and 26 05 00.

.2 Depending upon magnitude and complexity, divide control system into convenient sections, energize one section at a time and check out operation of section.

.3 Upon completion of sectional test, undertake group testing.

.4 Check out complete system for operational sequencing.

.5 Submit one copy of test results to the Engineer.

3.3 START-UP AND COMMISSIONING

.1 Perform all panel start-up and commissioning in accordance with Section 25 05 00.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All Sections of all Divisions of the Specifications and these Documents inclusive form part of the Contract Documents.

1.2 SCOPE

.1 This Section specifies the material, standard and practice requirements for construction of MultiSmart Powered by NexiconTM (MultiSmart PBN) control panels. Industry codes, standards and practices listed here represent the minimum compliance required, adherence to additional regulatory codes, standards and preferences may be required by the end user

1.3 SUBMITTALS

.1 Submit shop drawings in accordance with Section 01000 and include details on all functions, programming, flow charts, operator menus, control sequences, schematics, component dimensions, data storage quantity, data storage speed, data storage back-ups, and program storage back-ups.

Part 2 Products

2.1 FUNCTIONALITY

.1 The Intelligent Pump Station Manager MultiSmart Powered by Nexicon (PBN) shall provide “Out of the box” control of a typical pump station, with an intuitive user-interface. The product shall come with pre-built configuration parameters which are selectable via the user interface, including:

- .1 Functionality for advanced pump control of up to 6 pumps
- .2 Pump mode, for each pump, between Auto/ Manual / Off
  - .1 In manual control (semi-automatic manual) pump switches off at deactivation setpoint and reverts to Auto mode to prevent accidental pump run on
  - .2 To pump beyond off set point in manual button must be held down (full manual)
- .3 Setpoint for pump activation/deactivation and level alarms
- .4 Level devices 5 remote level floats
- .5 Selectable between fill / empty
- .6 Functionality for advanced pump control of up to 6 pumps including grouping and alternation
- .7 Station optimization including

.1 Max off time (odour reduction)
.2 Maximum pumps to run simultaneously (overload protection)
.3 Maximum starts per hour (pump protection)
.4 Pump start and stop delays
.5 Maximum run time (turn off inefficient or partially blocked pumps)
.6 Blocked pump detection with option for Pump Reversal
.7 Wet well washer controls
.8 Wet well clean out (periodic pump down to snore point)
.9 Pump groups with different configurations (e.g. alternation schemes) for each group

.8 "Locked level" alarm to indicate level device problem
.1 User-defined % change within a time period
.2 Different values for low use, high use times (user defined)

.9 Alternation schemes including:
.1 Fixed lead/duty
.2 Alternation
.3 Alternation N:1 (e.g., 3:1)
.4 Run most efficient pump, N:1 ratio, e.g. more efficient pump runs 20 times for each operation of the less efficient pump(s)
.5 Alternation by hours run or starts

.10 Pump decommission/commission
.1 Decommissioned pump automatically removed from control algorithm, alarms, displays, etc
.2 SCADA tag flags decommissioned status

.11 Six profiles of setpoints for spill management, off peak pumping, tariffing, etc
.1 Automatic profile change on date/time
.2 Selectable from SCADA, digital input, logic tag or faceplate
.3 Profile includes some pump control parameters – max no of pumps, max run time, max off time

.12 Datalogger for user-defined faults and events (process values)
.1 1000,000+ events to internal flash memory
.2 10,000,000 events by writing direct to SD card
.3 Download event and fault log as csv to SD card or USB keay for Excel analysis
.4 ftp transfer of event and fault log as csv for Excel analysis

.13 3-phase supply monitoring and supply anomaly protection
.1 Under-voltage
.2 Over-voltage
.3 Phase failure
.4 Phase reversal

.14 Monitoring of dc supply, battery voltage, and internal temperature

.15 Energy, power and pump efficiency monitoring:

.1 kW, kVA, power factor, kWHr, KVAH calculation for each pump
.2 pump efficiency calculation (litres or gals per kWHr) for each pump

.16 Motor protection including:
.1 3-phase current monitoring for each pump
.2 Over- and under-current trip
.3 Ground/earth fault
.4 Current phase imbalance fault
.5 I2T fault
.6 Power Factor – Low Power Factor measurement and detection for pump efficiency / impeller wear detection, blockage detection and dry run protection.
.7 Insulation resistance testing for motor windings
.1 Values and user-definable fault threshold

.17 Fault module with flexibility for any fault to
.1 hold out pump(s) or be display only
.2 auto-restart after user-defined time subsequent to fault condition clearing
.3 auto-restart user-defined number of times (subsequent to fault condition clearing) before locking out
.4 manual/ SCADA reset required

.18 Remote control via SCADA for
.1 changing mode of pumps (auto/off/manual)
.2 reset of pump and station faults
.3 changing pump and alarm setpoints
.4 changing setpoint profiles

.19 Security
.1 Admin user sets PINs for access to configuration of the unit
.2 Automatic datalogging of who has entered the configuration menu
.3 Automatic logging of all unsuccessful login attempts with date/time
.4 Digital input option, e.g. key switch, for access to configuration menu
.5 Multi-layer, multi-level security privileges for pages accessed and configured via Configurator program (free)

.20 SD Card Port allows
.1 Firmware upgrades
.2 Save/load configuration (allows backup to be restored, or configuration copied from another station)
.3 Download datalogger in CSV
.4 Export/import Modbus and DNP3 points list in csv format

.21 USB Port allows
.1 Firmware upgrades
.2 Save/load configuration (allows backup to be restored, or configuration copied from another station)
.3 Download datalogger in CSV

.4 Export/import Modbus and DNP3 points list in csv format

2.2 CONTROL PANEL COMPONENTS

.1 Reference Component Datasheets document for approved component technical data. Substitutions may be made for standard components as dictated by panel vendor and end user standards and preferences.

.2 Enclosure: The pump control panel enclosure shall be NEMA 4X polyester powder coated finish inside and out. The enclosure shall have provisions for padlocking the door. All exterior hardware and hinges shall be Stanley's steel.

.3 Enclosure Assembly: The enclosure assembly shall incorporate a hinged dead front inner door for mounting operator controls and to provide operator protection from live circuits inside the enclosure. The dead front door shall be steel, polyester powder coated finish inside and out.

.4 The enclosure assembly shall incorporate a steel, polyester powder coated subpanel for mounting of electrical components and wire management devices.

.5 Enclosure Heating: In climates where panel interior heating is required, the enclosure shall include a 120VAC circuit breaker and a thermostat-controlled panel heater capable of maintaining the enclosure interior air temperature above the minimum temperature specified for the components mounted therein.

.6 Main Circuit Breaker: The pump control panel shall be protected by a 3-pole molded case circuit breaker CSA approved. The main circuit breaker shall be manually operated by a rotary handle mounted through the dead front inner door. The rotary handle shall be mechanically interlocked such that the dead front inner door cannot be opened while the main circuit breaker is closed.

.7 Power Distribution Block: The load side of the main circuit breaker shall be terminated only on a power distribution block, which in turn shall provide branch circuit connections to the phase monitor, control power transformer and motor circuit protectors.

.8 Ground Lug: A ground lug shall be installed on the subpanel as shown on the panel layout drawings for connection of the incoming service ground conductor and to provide a single grounding point for pump, component and signal grounds. The ground lug shall be mounted to provide good electrical connection to the subpanel.

.9 Motor Circuit Protectors: Each pump motor shall be protected by a 3-pole motor circuit breaker providing thermal-magnetic protection with thermal setting, magnetic tripping at 13In and high breaking capacity Icu. Connection by screw clamp terminals. Start-stop control by rotary knob guaranteed for 100 000 cycles AC-3. Certified CSA.

.10 Motor Starters: There shall be a three-pole motor starter for each pump. The motor starter shall be across the line non reversing magnetic starter. Motor starters and overload protection shall be sized to accommodate the rated pump horsepower.

.11 Pump Current Transformer: One power leg of each pump shall be routed through a "donut-type" current transformer, sized according to the rated pump horsepower. The current transformer secondary windings shall be terminated on the terminal blocks connected to the pump controller current transformer inputs.

.12 Hand-Off-Auto Selector Switches: Selector switches shall be installed on the inner dead front door unit as shown on the panel layout drawings. Selector

switch shall be a heavy-duty oil tight “Hand-Off-Auto” three-position device to control the operating mode of each pump motor starter.

.13 Control Power Circuit Breakers: single pole, CSA approved, DIN rail mounted circuit breakers shall be installed on the subpanel to protect and provide a disconnecting means for 120VAC control circuits within the panel.

.14 Control Power Transformer: A single-phase control power transformer with a 120VAC secondary voltage shall be mounted on the subpanel as shown on the panel layout drawings. The control power transformer shall be sized to provide 120VAC power for: motor start circuits, 24VDC power supply, and other 120VAC branch circuit breakers. The control power transformer primary winding shall have both legs fused, the secondary winding shall have one leg fused and the other leg grounded.

.15 RJ45 Ethernet pass-thru port and USB type A pass thru port: An Ethernet pass-thru port and USB type A pass thru port shall be installed on the dead front inner door as shown on the panel layout drawings. Both Ethernet and USB ports should be provided with protective cap.

.16 24VDC Power Supply: Devices requiring DC power shall be supplied by a CSA Listed 24VDC DIN rail mounted, enclosed switching power supply which incorporates, UPS, overvoltage and overcurrent protection. The power supply shall be sized to provide 24VDC power for DC control circuits, instrumentation, and control devices. The power supply 24VDC output shall be fused, the 0VDC output shall be grounded.

.17 Pump Controller: Pump station operation shall be controlled by a MultiSmart MultiSmart Powered by NexiconTM pumping station controller, incorporating voltage-free digital I/O and pump status monitoring. The MultiSmart Powered by NexiconTM pumping station controller consists of a modular base unit installed on DIN rail mounted on the subpanel and a touchscreen operator interface installed in the dead front door as shown in the panel layout drawings. The MultiSmart Powered by NexiconTM pumping station manager shall receive its level signal from level floats, electrically limited by a single channel intrinsically safe barrier to prevent dangerous energy levels from reaching the potentially hazardous transducer location. Manufacturer’s requirements for installation and configuration shall be observed.

.18 Control Relays: Control relays shall be enclosed, plug-in type with screw terminal DIN rail mounted sockets.

.19 Terminal Blocks: Control terminal blocks shall be of the clamp screw type, rated for 600 volts. Amperage rating shall accommodate the control circuit amperage. Two Tier pass-thru terminals shall be used for analog instrument signals. Additional spare terminal blocks shall be installed in the cabinet for future use.

.20 DIN Rail: Where possible, devices shall be mounted on 35mm steel DIN rail as shown on the panel layout drawings. There shall be adequate space available on the DIN rail for additional devices as illustrated on the panel layout drawings.

.21 Wire duct: Slotted wire duct with removable covers for wire management shall be installed as shown on the panel layout drawings.

.22 Enclosure Nameplate: The enclosure shall include a metallized polyester nameplate containing data as required by the customer and may include the following information or other relevant data: voltage, phase, rated horsepower, control panel manufacturer's name, amperes, etc.

.23 Device Labeling: Electrical devices mounted in the enclosure shall be permanently labeled with the identifying device code as seen in the electrical diagrams. Labels may be engraved lamacoid or printed self-adhesive vinyl and placed on the subpanel as close to the device as reasonably possible to provide adequate visibility

.24 The panel shall be equipped with a 5G/LTE cellular modem suitable for FlygtCloud SCADA Service communications and installed on the subpanel as shown in the panel layout drawings. The panel shall also be equipped with a dome type 5G/LTE MIMO antenna suitable for use with a cellular modem with bracket for mounting on the side of the enclosure or in an alternate location as the site requires. Modems should be able to flip between at least two networks in case one has an outage. Unmanaged Ethernet switch shall be provided to accommodate all Ethernet equipment connection requirements. Manufacturer's requirements for installation and configuration shall be observed.

.25 The panel shall be equipped with a lightning surge protector connected to the load side of the main circuit breaker to protect motors and control equipment from lighting induced line surges. The surge protector shall be CSA approved and installed per manufacturer's specifications.

2.3 PROGRAMMABILITY

.1 The product shall have the option of IEC61131-3 and IEC61499 compliant PLC programming language to enhance/interact with all the modules in the pump station manager.

.2 The product shall have the option of a simple logic engine to enhance/interact with all the modules in the pump station manager.

2.4 I/O

.1 The I/O shall be expandable to many hundreds of I/O points per unit. Available I/O types shall include:

.1 Digital inputs (voltage free input), also configurable as counters

.2 Digital outputs (240V, 5A resistive)

.3 Analog inputs (10bit)

.4 Analog outputs (10bit)

.2 Digital Inputs configurable for pump leakage sensor, motor temperature sensor, and other pump station requirements

.3 Additionally, the Digital Inputs shall be selectable as pump station specific I/O to reduce components in the panel and therefore save cost, e.g. remove pump relays such as mini-CAS relays, MAS relays.

.1 Seal sensor (conductive)

.2 PTC Thermistor

.3 Flygt FLS & CLS

.4 Conductive probe (for liquid level sensing)

.4 Specific I/O for motor protection and current/voltage monitoring

.1 The product shall have I/O cards to minimise additional components which include:

.1 Motor insulation resistance test (IRT) to 1000v

.2 3-phase current monitoring, derived from CT's, 0.5% resolution

.3 3-phase supply monitoring, 0.5% resolution. Up to 630V phase to phase.

2.5 USER INTERFACE

.1 The field hardware shall include a user interface for operations and configuration. The display shall provide status of most aspects of the pump station, control of pumps, resetting of faults, and configuration of parameters.

.2 Status

.1 The following parameters shall be displayed on the main screen:

.1 Level in user definable units eg %, metres or custom units

.2 Set points for alarms and pump start/stop

.3 Pump running/stopped

.4 Pump available/unavailable

.5 3-phase current for each motor

.6 Faults

.7 Voltage supplied

.8 Date/time

.9 User-configurable option to display pump efficiency, flow rates, total starts, total hours run and other parameters

The screen will also have buttons to allow the user to access Faults, History, Information and Settings.

.2 Information screens

.1 The following parameters shall be available via a user key press from the main screen:

.2 Hours Run accumulators for each pump & the station with the following comparisons

.3 last minutes run

.4 this hour, last hour

.5 today, yesterday

.6 this week, last week

.7 total hours run

.3 Starts accumulators for each pump & the station with the following comparisons

.1 this hour, last hour

.2 today, yesterday

.3 this week, last week

.4 total starts

.4 Flow values, either derived from calculations or via a flowmeter

.1 Inflow

.2 pump flow rate

.3 total volume
.4 overflow data, including start time, duration, estimated volume
.5 Power & efficiency
.1 pump efficiency in litres or gals per kWHr - or KVAH
.2 power in kW, KVA
.3 power factor
.4 energy accumulators per pump in kWHr and KVAH
.6 Status of all I/O
.1 Digital I/O open/closed and accumulator
.2 Analog I/O mA and scaled
.3 3-phase voltage, current, frequency, phase angle, power factor
.7 Database viewer to view all datapoints/tags in real time
.8 Communications stats

.3 Control
.1 The following aspects of the system, as a minimum, shall be controlled intuitively through the user-interface:
.1 Pump mode, for each pump, between Auto/ Manual (Hand)/ Off
.2 Pump fault reset
.3 Level alarm reset

.4 Fault screen
.1 The main screen shall include a Fault button which takes the user to a Fault screen and allows them to check all current and unacknowledged alarms.
.2 The fault screen will detail the fault (e.g. contactor fail, leakage sensor fault, motor overtemperature, over-current, etc.) along with date/time each fault occurred and cleared.
.3 A reset option for a fault will be presented to the user when faults can be acknowledged/reset.

.5 History screen
.1 The main screen shall include a History button which takes the user to a History screen
.1 View all date/time stamped faults and events
.2 Filter by pump or other station parameters, by time period
.3 Export via CSV for analysis in Excel

.6 Configuration
.1 The user interface should allow intuitive configuration of the system, including as a minimum:
.1 Setup Wizard to allow a complete configuration (display, IO and configuration of functional blocks) by the user answering simple questions
.2 Set-points, including alarm and pump setpoints

.3 Enable/disable level alarms (so that for example, the low-level alarm can be easily activated or deactivated)

.4 Start, stop and alarm delays

.5 Alternation/ fixed sequence and grouping of pumps where necessary

.1 Configure I/O

.1 Assign primary/backup level to any input, e.g. 4-20mA or conductive probe

.2 Assign pre-defined (or user-defined) faults, e.g. thermal overload, contactor fail, to any digital input

.3 Zero and span analog inputs

.4 Set Digital outputs to change state with any digital tag in the system

.5 Set Analog outputs to follow any analog value, including primary level

.6 Fault configuration for each fault to either

.1 display only

.2 manual/SCADA reset before pump becomes available

.3 auto-restart (after fault condition clears) with configurable restart time

.4 auto-restart user-selectable number of times within time window before locking out

.5 customized text for fault and event name

.7 Pump station optimization parameters such as:

.1 Max off time (odour reduction)

.2 Maximum pumps to run (overload protection)

.3 Maximum starts per hour (pump protection)

.4 Inter-pump start and stop delays

.5 Maximum run time (turn off inefficient or partially blocked pumps)

.6 Well washer controls

.7 Well clean out (periodic pump down to snore point)

.8 Random duty start (random time after activation point reached before pump starts) to reduce fat build up

.9 Optimization parameters applied differently to different groups of pumps if required

.8 Supply protection

.1 Under- and over-voltage alarm points

.2 Volts phase imbalance and volts phase rotation

.3 DC-supply alarm point

.9 Motor protection

.1 Under-current

.2 Over-current

.3 Ground/earth fault

.4 Phase fail

.5 I2T protection

.10 Communications ports, speeds and addresses

The configuration of the unit will also allow the user to save a known good configuration on the unit itself that they can revert back to at any time.

.7 Configuration backup and restore & Firmware upgrades

.1 The Configuration interface will allow the user to save and restore configurations onto a SD card or USB storage device, to allow easy configuration from saved versions (or copying settings from one site to another).

.2 The unit will allow the user to backup system log files, alarm and event log files, and custom scripts via the SD or USB ports.

.3 The unit shall allow for the import of DNP3 and Modbus point lists and custom logic scripts via the SD or USB ports.

.4 Firmware upgrades will be possible by copying the upgrade image onto a SD card, or USB storage device, then inserting into a field unit and cycling power.

.8 Maintainability

.1 The supplier shall also demonstrate that their system is maintainable in the future, especially that future applications do not incur any user-interface development cost on the customer, i.e., the user-interface shall be an integral part of the system.

2.6 COMMUNICATIONS

.1 It shall be possible to use the following protocols to communicate with the system. At any given time, only one of the protocols shall control the system.

.2 TCP/IP – The system shall communicate with a local network through the NexiconTM application manager module. It shall be possible to assign IP addresses manually or automatically by using DHCP/s

.3 SCADA communication – The following protocols can be used for communication with SCADA:

- DNP3
- IEC 60870-5-104

2.7 ENVIRONMENTAL

.1 The unit shall meet the following environmental ratings

.1	Working temperature	-40°C to +60°C
.2	Storage temperature	-40°C to +90°C
.3	Humidity	5% to 95% (non-condensing)
.4	IP Rating	Controller: IP20, NEMA 1
		Display: IP65, NEMA 4

2.8 ACCESSORIES

.1 The field hardware shall be capable of supporting a Flygt color touch screen HMI (Human Machine Interface) that can provide status of most aspects of the pump station including the status of level, pumps, control of pumps & ancillary equipment, configuration of operating parameters, display & reset of faults and display of logged data.

.2 The panel shall be equipped with a monitoring relay for leakage detection and stator high temperature MAS711 as fabricated by Flygt. In case of a malfunction, the monitoring relay should stop the pumps. On high temperature detection a pump shall not be made available until a manual reset has been performed.

.3 The panel shall be equipped with NexiconTM Digital I/O module(s), XDC 411.

.4 The extended digital input/output module in the MultiSmart PBN system shall include the following:

- Six digital inputs

The module shall be energized from the NexiconTM backplane

.5 The panel will receive 5 level indication from Flygt ENM-10 float switches

.6 The control panel shall be equipped with an UPS to provide approximately two (2) hours of back-up.

.7 The panel shall be equipped with a 120VAC GFCI outlet

2.9 PANEL CONSTRUCTOR REQUIREMENTS

.1 The manufacturer of the control panel shall be a vendor approved by Xylem and familiar with the requirements of this specification.

.2 The manufacturer of the control panel shall be CSA certified to construct control panel assemblies per CSA standards and label as such.

Part 3 Execution

3.1 INSTALLATION

.1 Mount and install MultiSmart (PBN) pump controller and associated equipment in the control panels as indicated on the drawings and as specified in Section 25 14 23.

.2 Complete MultiSmart (PBN) pump controller and control system installation, testing, start-up and commissioning shall be as described in Section 25 05 00.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 A brief but not necessarily all inclusive list of works to be performed under this contract is given herein.

.2 The Contractor shall supply all labour, material, equipment, transportation, services and facilities necessary to make, test and place into operation a complete electrical installation as shown on the drawings and/or as specified herein.

.3 Where the term "provide" is used herein, it shall mean "supply, install, adjust, test and place into operation".

.4 All systems shall be completely assembled, adjusted, tested and demonstrated to be ready for operation to the satisfaction of the Engineer.

.5 The Contractor shall carefully examine the drawings and specifications and shall fully inform himself/herself as to all existing conditions and limitations, including all laws, ordinances and regulations affecting the contract and the work and shall include in his/her tender all items implied or required to complete the work of this contract.

.6 The Contractor shall satisfy themselves as to working space, storage space, access facilities and all other conditions pertaining to the site, relating to the conduct of their operations, by the inspection of the site and examination of the drawings.

.7 Refer to all other Divisions of the Specifications to determine their effect upon the work of this Section. All Sections of all Specification Divisions as well as appendices form part of the Contract Documents.

1.2 EXTENT OF WORK

.1 This work shall consist of furnishing of all labour, material, equipment, and all incidentals.

.2 Work shall include, but not be limited to:

- .1 All systems shall be complete and functional.
- .2 All works shall be to good practices and industry standards.
- .3 All works shall be robust, tidy, and safe from mechanical injury.
- .4 All works shall be suitable for the presence of water, chemicals, humidity, vapor, sunlight, heat, cold, insects, vermin, and other environmental influences.
- .5 Provide electrical works as indicated on drawings and as required for complete functional systems.
- .6 Wire to and make connections to, all electrical power and control items required, including motors, controls, etc.

.3 Coordinate with Contractors and equipment vendors to determine the functionality, wiring, and sequences for all equipment, and any required hardware or programming to support any equipment. Carry out this exercise at the shop drawing stage of the project. Assist other trades to make their shop drawings complete, coordinated, and suitable for a proper functional implementation of the works, prior to submission of shop drawings. Incorporate results from this coordination into own shop drawings, prior to submission.

Shop drawings from the various trades are to be coordinated, in agreement, and whole. This coordination is to cover all works, including but not limited to,

.1 Electrical.
.2 Instrumentation.
.3 Automation.
.4 Field devices.
.5 Field equipment.
.6 Packaged equipment.
.7 Control panels.

.4 The Electrical, and Process Drawings and these Specifications are complementary to each other and each form a part of the contract. In the event of discrepancies between Drawings and Specifications, the more restrictive conditions of the two shall apply, unless a written clarification is obtained from the Consultant.

.5 Coordinate all work with other trades on the job, such that a complete functioning system can be supplied as shown on the Drawings and Specifications for this project, and there is no disruption to the other trades on the project.

1.3 SUBMITTALS

.1 Information packages submitted for review and/or approval shall include:

.1 An index page.
.2 Have component items identified with the Specification Section and equipment tag from the equipment and/or instrument list.
.3 Where manufacturers' information, catalog, cut-sheet, or brochure information is used, which list more than one style or member of a family or options, the actual component or item being supplied shall be clearly highlighted.

1.4 EXAMINATION OF DRAWINGS

.1 The electrical drawings do not show all architectural, mechanical and structural details. All electrical schematics are shown diagrammatically unless otherwise noted. The Contractor shall review the mechanical, structural and architectural drawings to obtain building dimensions and details. Verify dimensions accurately by measurements.

.2 To change the location of electrical equipment, submit a request in writing to the Engineer for approval. If approved, such changes are to be made at no additional cost to the Owner.

.3 No extra will be allowed for any additional labour or materials required for relocation of equipment due to interference with equipment of other trades, beams, joists, walls, etc., unless the conflict has been submitted to the Engineer in writing before closing of tenders.

1.5 APPROVED DESIGN AND INSTALLATION

.1 Equipment and material to be of approved design and manufactured in accordance with all governing regulations such as "Canadian Standards Association", "Canadian Electrical Code", "Provincial Department of Labour", "Underwriters Laboratory", etc. Equipment

and material must bear applicable acceptance labels of all associations and governing bodies recognized by the municipal, provincial and federal authorities.

.2 Install equipment in strict accordance with manufacturer's recommendations and governing rules, regulations and codes.

.3 Where requirement conflict occurs, install all materials in accordance with the most severe requirements.

.4 Material installed under this Division to be new and of uniform construction.

.5 All installations are to ensure maximum headroom, minimum interference with free use of surrounding areas, and best access to equipment.

.6 To deviate major service runs from the location shown on the drawings, submit to the Engineer suitable drawings showing such deviations together with reasons for deviations and obtain approval from the Engineer before proceeding with the installation.

1.6 CODES AND STANDARDS

.1 All works shall comply with the more stringent of the Contract Documents and the current editions of the Electrical Code, Building Code, and all standards and regulations bearing on the project, including all local amendments, laws, rules, ordinances and codes. Notify Engineer of any discrepancy between Contract Documents and regulations.

.2 Electrical installation shall be in accordance with the requirements of the local supply authority and local inspections authority.

.3 Provide a copy of all standards referred to in this Section for use on site.

1.7 PERMITS, INSPECTIONS AND FEES

.1 Deliver to the Engineer all necessary interim and final certificates of inspection and approval which may be required by all Inspection Authorities having jurisdiction over the work, as evidence that the work installed conforms to the laws and regulations of all governing authorities.

.2 Submit copies of all plans and specifications to the authority having jurisdiction for inspections as may be required prior to commencement of work to comply with the above.

.3 Notify the Inspection Authorities in sufficient time for them to arrange to inspect work.

.4 Pay all associated fees.

1.8 ABBREVIATIONS

.1 Abbreviations for electrical terms shall be to CSA Z85-1983.

.2 Names used throughout these specifications are:

EEMAC	Electrical & Electronic Manufacturers Association of Canada (formerly CEMA)
CSA	Canadian Standards Association
FM	Factory Mutual
NEMA	National Electrical Manufacturers Association (U.S.)

JIC	Joint Industry Conference
IPCEA	Insulated Power Cable Engineers Association
ISA	Instrument Society of America
CEC	Canadian Electrical Code
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
NBC	National Building Code
ANSI	American National Standards Institute
OESC	Ontario Electrical Safety Code
ESA	Electrical Safety AuthorityAbbreviations not identified here shall have

their common industry meaning. Where there is any doubt or dispute as to the meaning of an abbreviation, the meaning shall be that indicated by the Engineer.

1.9 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01000.

.2 Shop drawings submittals shall be of the highest quality.

.3 Submit shop drawings for all equipment as indicated with the exception of conduit, standard conduit fittings and low voltage wiring.

.4 Indicate on shop drawings ratings, details of construction, dimensions, capacities, weights, electrical performance characteristics, installation information specific to the piece of equipment, and the application, and performance and operation information of the equipment or material.

.5 Include wiring diagrams specific to the installation of each item, single line diagrams, and schematic diagrams.

.6 Wiring drawings showing interconnection with work of other divisions are required.

.7 Indicate the number or letter used as an identification symbol on product data for panelboards, lighting fixtures and other equipment.

.8 All equipment on shop drawings to be clearly identified with specific device tagging as identified in the specifications and drawings.

.9 Review of the shop drawing by Consultant shall not relieve the Contractor of the responsibility for errors or omissions therein.

.10 Where a shop drawing indicates a range of products or product family, the specific product shall be clearly highlighted.

.11 Where electrical equipment requires support or backing by other trades or mechanical connections, the shop drawings shall also be circulated through the other "services" contractor(s) prior to submission to the Consultants.

1.10 DRAWINGS AND MEASUREMENTS

.1 Drawings are generally diagrammatic, are intended to indicate the scope and general arrangement of work and are not detailed installation drawings. Do not scale the drawings.

.2 Consult the process layouts and architectural drawings and details for exact locations of fixtures and equipment. Obtain this information from the Consultant where definite locations are not indicated.

.3 Take field measurements, where equipment and material dimensions are dependent upon building dimensions.

1.11 OPERATION AND MAINTENANCE MANUALS

.1 Provide operation and maintenance data for incorporation into maintenance manual specified in Division 01 and as follows:

.2 Include in operations and maintenance data:

.1 Details of design elements, construction features, component function and maintenance requirements, to permit effective operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.

.2 Technical data, product data, supplemented by bulletins, component illustrations, exploded views, technical descriptions of items, and parts lists. Advertising or sales literature not acceptable.

.3 Wiring and schematic diagrams.

.4 Names and addresses of local suppliers for items included in maintenance manuals.

.3 Include in the manual the following major sections:

.1 Title page (in plastic cover).

.2 Comprehensive description of the operation of the systems, including the function of each item of equipment within the system.

.3 Detailed instructions for the normal maintenance of all systems and equipment installed including procedures and frequency of operational checks and service and trouble shooting instructions.

.4 Local source of supply for each item of equipment.

.5 Wiring and control diagrams.

.6 Spare parts list.

.7 Copies of guarantees and certificates.

.8 Manufacturer's maintenance brochures and shop drawings.

.4 The manual information shall be bound in a three “D-ring” hard back reinforced vinyl covered ("bar lock" post type where more than 2 in rings required) binder c/w index tab separators to divide the different sections.

.5 Submit one (1) digital and one (1) printed copy of manuals and “as-built” drawings to the Engineer for review and approval thirty (30) days prior to start up of the systems and equipment. Revise initial manual as required by the Engineer prior to final submission.

.6 Submit three (3) printed copies and one (1) digital copy in the final approved form.

1.12 MAINTENANCE SECTION

.1 General:

.1 Summarize data for this section from Contractor supplied maintenance submissions, supplemented by any additional appropriate data.

.2 Include maintenance as a section of each system.

.3 Organize data into sections, with divider tabs as follows:

.1 Maintenance Tasks and Schedules

.2 Spare Parts

.3 Suppliers and Contractors

.4 Tags and Directories

.5 Maintenance Brochures

.2 Maintenance Task and Schedules:

.1 Organize data according to system category, with further breakdown into individual systems. Provide section index and divider tabs for each system category. Summarize maintenance tasks from maintenance manufacturer's brochures, for each component of system in following format:

.1 Daily

.2 Weekly

.3 Monthly

.4 Semiannually

.5 Annually

.6 When required

.3 Spare Parts List:

.1 Organize data according to system category, with further breakdown into individual systems. Provide section index and divider tabs for each system category. Summarize maintenance tasks from maintenance manufacturer's brochures, for each component of system.

.4 Suppliers and Contractors List:

.1 Provide summary of suppliers and contractors for each component of the system. List name, address and telephone number of each.

.5 Maintenance Brochures:

.1 Include copies of all manufacturers' printed maintenance brochures pertaining to each product, equipment or system. Provide section index and divider tabs. Maximum of twenty-five sheets or one brochure per tab.

1.13 RECORD DRAWINGS

.1 Submit record drawings

.2 The Contractor shall record all changes made during construction and provide record drawings to the Owner upon completion of the work.

.3 At the completion of the project, the Contractor shall submit one (1) set of record drawings, accurately recording all changes, deviations and relocations necessitated by job

conditions and equipment approved shop drawings. Record drawings to be a single set compilation of all site changes neatly recorded in red pencil to the satisfaction of the Engineer.

.4 Include with the record drawings a list for each motor indicating motor or equipment number and name, nameplate voltage, horsepower and current, the size and setting of overload and breaker or fuse protection provided.

1.14 DEFINITIONS

.1 The following are definitions of terms and expressions used in the specification:

.1 "Inspection Authority" means agent of any authority having jurisdiction over construction and safety standards associated with any part of electrical work on site.

.2 "Supply Authority" means electrical power company or commission responsible for delivery of electrical power to project.

.3 "Electrical Code" means the current edition of the Ontario Electrical Safety Code (OSEC) and Electrical Safety Authority (ESA) bulletins. The OSEC and ESA bulletins includes, modifies, and gives technical advice on the Canadian Electrical Code C22.1.

.4 "Indicated" means as shown on contract drawings or noted in contract documents.

.2 Refer to CSA C22.2 No.0 for "Definitions and General Requirements".

1.15 COOPERATION AND COORDINATION

.1 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations to the design intent involving extra cost to the Owner, without the Consultant's written approval.

.2 The drawings indicate the general location and route to be followed by the electrical services. Where details are not shown on the drawings or only shown diagrammatically, the services shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass. Service lines shall run parallel to building lines. All services in the ceiling shall be kept as tight as possible to beams or other limiting members at high level. All electrical services shall be coordinated in elevation to ensure that they are concealed in the ceiling or structural space provided unless detailed otherwise on drawings.

.3 Work out jointly all interference problems on the site and coordinate all work before fabricating or installing any material or equipment. Where necessary, produce interference/coordination drawings showing exact locations of electrical systems or equipment within service areas, shafts and the ceiling space. Distribute copies of the final interference/coordination drawings to the Consultant and all affected parties.

.4 Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Consultant of space problems before installing any material or equipment. Demonstrate to the Consultant on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required.

.5 Schedule expediting of all materials and execution of work with associated work specified in other Divisions.

.6 Cables, conduits and fittings to be embedded or plastered over neatly and close to building structure so furring can be kept to a minimum.

.7 Arrange for holes through exterior walls and roof to be flashed and made weatherproof.

1.16 SOURCE QUALITY CONTROL

.1 Arrange for a plant inspection by Engineer where specified.

.2 Inform Engineer of manufacturing progress and arrange inspections at appropriate times.

.3 Action required by factory inspection shall not be construed as final acceptance.

.4 Obtain a Certificate of Acceptance from the inspection authority on completion of work and provide to the Engineer.

.5 The Engineer may carry out inspections and prepare deficiency lists for action by the Contractor, during and on completion of project.

1.17 GUARANTEE

.1 Guarantee work described in this Section of the specification against all defects in labour and materials.

1.18 CARE, OPERATION AND START-UP

.1 Instruct the Owner's operating personnel in the operation, care and maintenance of equipment.

.2 Arrange and pay for services of manufacturer's factory service representative to supervise start-up of installation, check, test, adjust, balance and calibrate components.

.3 Provide these services for such period, and for as many visits as necessary, to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.19 RESPONSIBILITIES

.1 Ensure that equipment does not transmit noise and/or vibration to other parts of the building, as a result of poor installation practice.

.2 Where the Contract Documents do not contain sufficient information for the proper selection of equipment for bidding, notify the Consultant during the tendering period. If clarification is not obtainable, allow for the most expensive arrangement. Failure to do this shall not relieve the Contractor of responsibility to provide the intended equipment.

.3 Protect equipment and material from the weather, moisture, dust and physical damage.

.4 Cover equipment openings and open ends of conduit, piping and pullboxes as work progresses. Failure to do so will result in the Trade being required to adequately clean or replace materials and equipment at no extra cost to the Owner.

.5 Protect all existing services encountered. Obtain instructions from the Engineer when existing services require relocation or modification.

.6 Restore damaged or marred factory finish to factory quality.

.7 The specifications and drawings form an integral part of the Contract Documents. Neither the drawings nor the specifications shall be used alone. Work omitted from the drawings but mentioned or reasonably implied in the specifications, or vice versa, shall be considered as properly and sufficiently specified and shall be provided. Misinterpretation of any requirement of either plans or specifications shall not relieve this Contractor of the responsibility of properly completing his/her trade to the approval of the Consultant.

1.20 STANDARD OF ACCEPTANCE

.1 Standard of Acceptance means that item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.

.2 Where two or more manufacturers are listed, the manufacturer's name shown first or underlined or shown with a model name and/or number was used in preparing the base design. Tenders may be based on any one of those named, provided that they meet every aspect of the base design and every aspect of the drawings and specifications.

.3 Where other than the first named or the underlined manufacturer or scheduled/specified manufacturer is selected or approved, include for the cost of any resulting work (both under this Division and other Divisions) and any necessary redesign of installation or structure. Submit redesign drawings for review with Shop Drawings. Maintain installation, access and servicing clearances. Equipment/materials shall not exceed the available space limitations. Redesign drawings shall be to scale and of a standard equal to the Project Drawings.

.4 A visible manufacturer's nameplate shall indicate manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps.

1.21 ADDITION OF ACCEPTABLE MANUFACTURERS

.1 Material/products considered to satisfy the specification, but of a manufacturer other than those named may be submitted to the Consultant for consideration not later than five (5) working days prior to closing of tender.

.2 Alternate approvals will be given in writing only. No other substitution will be permitted after closing of tenders.

.3 Alternate approvals granted before the closing of tenders will be limited to a manufacturer's system and/or series only. This limited approval will not preclude substitute equipment/material from complying with specific features included with equipment/material specified. Determine that the alternate product meets the specification intent before basing a tender on the product

.4 Where alternate equipment/materials are selected, allow for effects on other parts of the work of this Trade and other Trades. Where substantial changes in arrangement are required, submit shop drawings of the proposed changes with Plan and Section views and show effects on work of other Trades. Alternate equipment/materials shall not exceed the available space limitations. Maintain installation, access and servicing clearances. No extra will be allowed due to the use of alternate equipment/materials.

.5 Where two or more items of equipment and/or material, of the same type, are required, provide products of a single manufacturer.

.6 Install and test all equipment and material, in accordance with the detailed recommendations of the manufacturer.

Part 2 Product

2.1 GENERAL

.1 All materials shall be fully approved by the Canadian Standards Association (CSA) or cUL, unless otherwise specified, for use as installed and meet the requirements of this specification in all respects.

.2 Where there is no alternative to supplying equipment which has CSA or cUL approval, submit such equipment to local inspection authority having jurisdiction for special inspection and obtain approval prior to shipment of said equipment to site. Pay all associated fees.

.3 Materials and equipment shall be of Canadian manufacture except where specified otherwise or where Canadian made materials or equipment do not exist.

.4 Where two or more units of the same class or type of equipment are required, the units shall be the product of a single manufacturer, although components of equipment need not be products of the same manufacturer.

.5 Use material and equipment available from regular production of manufacturer.

.6 Control panels and component assemblies to be shop manufactured.

.7 Supply, Mount and Install all instrument mounting stands and backboards as indicated.

.8 All current carrying equipment including but not limited to cabling, panel busbars, transformer windings, splitters and etc shall be copper unless otherwise noted.

2.2 ARC FLASH SAFETY LABELLING

.1 Provide arc flash labeling on electrical equipment in accordance with CSA – Z462. Provide an arc flash study report authentical by a professional engineer licensed in the Province of Ontario and support the data placed on the labels.

2.3 FINISH

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint outdoor electrical equipment "equipment green" finish.

.2 Paint indoor switchgear and distribution enclosures light grey to ANSI 61.

.2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

2.4 VOLTAGE RATINGS

.1 Operating voltages to be within those defined in the current edition of CSA Standard C235.

.2 All motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment must be able to operate in extreme operating conditions established in above standard without damage to equipment.

2.5 WIRING TERMINATIONS

.1 All devices used for termination of wiring must be suitable for copper conductors, where copper is used, and for aluminum conductors, where aluminum is used.

2.6 ENCLOSURES

.1 Minimum enclosure type to be used is NEMA 12 gasketed nonventilated for ordinary environments, NEMA 4X for wet or corrosive environments, Class I Div I for hazardous locations or NEMA 3R for outdoor installations unless otherwise indicated.

2.7 MANUFACTURERS AND ELECTRICAL CERTIFICATION LABELS

.1 Manufacturers' nameplate and electrical certification labels (CSA, cUL, etc.) labels are to be visible and legible after equipment is installed.

.2 These nameplates shall be in place before equipment is shipped to site.

.3 On-site approvals will not be acceptable unless express written consent is obtained, prior to the shipment of the equipment to site, from the Engineer. Costs related to on-site approvals will be the responsibility of the contractor.

2.8 WARNING SIGNS

.1 As specified and to meet requirements of Electrical Inspection Department and Engineer.

.2 Minimum size 178mm x 254mm

.3 All electrical equipment or items with multiple power sources shall have warning signs firmly attached indicating at a minimum "WARNING: FED FROM MULTIPLE POWER SOURCES" and indicate all of the power source circuit ID's. The warning label shall be indicated in a conspicuous location on the equipment.

2.9 IDENTIFICATION OF UNDERGROUND INSTALLATIONS

.1 Provide permanently secured lamacoid labels as required.

.2 Mark each label, prior to permanent mounting, with the information as indicated.

Part 3 Execution

3.1 WORKMANSHIP

.1 Where sheet metal enclosures are not provided with knockouts, Greenlee punches shall be used in all cases. Cutting torches shall not be used for making holes.

.2 Install equipment, conduits and cables in a workmanlike manner to present a neat appearance to the satisfaction of the Consultant. Install conduit and cable runs parallel and perpendicular to building lines, in chases, behind furring or above ceilings, where

such concealment is possible. In areas where systems are to be exposed, install neatly and group in a tidy appearance..

3.2 RELOCATION OF EQUIPMENT

.1 Consider the location of electrical items (Power Distribution Panel, Control Cabinet, , etc..) indicated on Drawings as approximate and may be moved by the consultant up to 3000 mm from location shown without change to Contract Price, provided notice is given to Contractor before related work has commenced.

.2 Locate equipment to provide minimum interference and maximum usable space, and in accordance with manufacturer's recommendation for safety, access, and maintenance.

.3 All locations of electrical equipment shall be confirmed by the contractor at the commencement of the project and prior to installation of house keeping pads, otherwise contractor cannot claim for additional coasts.

.4 Inform the Consultant of:

.1 Conflicting installation requirements. Install as directed.

.2 An impending installation. Install as directed.

.3 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

3.3 INSTALLATION

.1 Determine manufacturers' recommendations regarding storage and installation of equipment and adhere to these recommendations.

.2 Check all factory joints and tighten where necessary to ensure continuity.

3.4 LOAD BALANCE

.1 Measure phase current to panelboards with normal loads operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test

3.5 SPECIAL PROTECTION

.1 Accept the responsibility to protect those working on the project from any physical danger due to exposed electrically energized equipment such as panel mains, outlet wiring, etc. Shield and mark all live parts "LIVE - 600 VOLTS" or with the appropriate voltage.

.2 Arrange for the installation of temporary doors, barriers, etc., for all electrical equipment. Keep these doors locked at all times except when under direct supervision.

.3 Where other site work occurs that creates dust, condensing humidity, or corrosive fumes ensure that all electrical components are protected from exposure to said hazards in order to preserve the serviceability and integrity of the electrical systems.

3.6 EQUIPMENT IDENTIFICATION

.1 Supply and install identification nameplates on all equipment such as motor starters, safety switches, panelboards, pushbutton stations, etc. and any equipment not so supplied. All nameplates shall be securely fastened to equipment with stainless steel screws.

.2 All identification nameplates, except for motors, shall be laminated phenolic with minimum 6 mm (1/4 inch) black letters on white background, the wording of which shall be identical to that on the single line diagrams and the title of the equipment controlled. Motor nameplates to be of non-corroding metal stamped or engraved with black lettering on light background.

.3 Warning nameplates shall be laminated phenolic with minimum 6 mm (1/4 inch) white letters on red background, the wording to be reviewed by the Engineer. All warning nameplates to be screwed to equipment.

.4 Warning nameplates required by Inspection Authorities shall be provided for all electrical switchgear and equipment and on access doors to electrical rooms, vaults, switchyards, etc. in accordance with the applicable Code regulations. Obtain all necessary details from the Inspection Authorities.

.5 Where wording not specified on the drawings, obtain exact wording from the Engineer.

.6 Install Underground Installation labels as required by the Inspection Authority in the Electrical Code.

.7 Identify pull boxes, terminal cabinets and junction boxes enclosing cables or connections with nameplates indicating voltage, box number and circuit number.

.8 Provide junction boxes, relay panels and miscellaneous equipment energized from two or more sources with a warning nameplate prominently displayed, noting number and location of sources and their voltage.

.9 Provide a typewritten circuit directory with a clear plastic cover for each panelboard in a suitable holder on the inside of each panel door. Unless otherwise noted, the directory shall indicate breaker or switch circuit number, rating, load description and associated load data.

.10 Manufacturer's nameplates and electrical certification labels to be visible and legible after equipment is installed.

3.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

3.8 TOUCH-UP PAINTING

.1 Be responsible for field touch-up painting of all shop painted electrical equipment installed in this Contract.

.2 All surfaces to be painted shall be dry, clean, free from dust, dirt, grease, frost, rust, loose crystals or extraneous matter, tool and machine marks. Feather out edges of scratch marks to make patch inconspicuous.

.3 Apply one or more coats of paint until the damaged surface has been restored to original finish condition. Do not apply succeeding coats until preceding coat is dry and hard. Sand lightly between coats with No. 00 sandpaper.

.4 Be responsible for obtaining the necessary touch-up paint of the original type and quality from the equipment manufacturer.

.5 Supervise priming and finish painting of all electrical equipment and material not shop painted.

3.9 SLEEVES AND OPENINGS

.1 Provide sleeves and openings for exposed conduits, busways, and wireways, where they pass through walls or floors conforming to relevant fire codes where applicable.

.2 Sleeves for individual conduits shall be galvanized steel in ordinary areas or stainless steel in corrosive environments.

.3 Pack or fill sleeves and openings after the completed work is in place. Filling shall provide a waterproof seal to prevent leakage of water or other liquids through the sleeve or opening. For larger gaps (1/2” of larger) to use spray foam insulation to seal opening and an escutcheon plate over for protection from the elements. For smaller gaps, an exterior rated silicone should be used. Use cap plate for improved looks (matches the color of the adjacent panel).”

.4 Sleeves and openings shall not displace reinforcing steel, and shall receive approval of the Engineer prior to placement.

3.10 CUTTING AND PATCHING

.1 Do all drilling, cutting, fitting and patching necessary for the running and securing of conduits, cable tray, wireways, and other electrical equipment.

.2 Provide supports necessary for same.

.3 Provide bracing and anchorage of work subject to Engineer's approval.

.4 No cutting of the structural members or of their fireproofing shall be done without the written consent of the Engineer.

.5 Caulk and flash all conduits passing through walls, roofs or other surfaces exposed to weather or as indicated on the drawings to prevent the passage of water and/or sewer gases.

3.11 HANGERS AND SUPPORTS

.1 Provide hangers, angles, channels, and other supports necessitated by field conditions to install all items of electrical equipment. Design of supports and methods of fastening to building structures shall be subject to the Engineer’s approval.

.2 All local motor control devices are to be grouped and mounted on a free-standing frame of stainless steel construction easily accessible and as close to the motor as possible.

.3 Provide weight-distribution facilities, where required, so as not to exceed the load-bearing capacities of floors or walls that bear the weight of, or support, electrical items.

.4 Paint all exposed parts of hangers and supports with an rust inhibiting primer.

.5 Equipment shall not be held in place by its own weight. Provide base anchor fasteners in each case.

3.12 PROTECTION OF EQUIPMENT

.1 Protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps.

.2 Fixtures, materials, equipment, or devices damaged prior to final acceptance of the work shall be restored to their original condition or replaced by the Contractor.

3.13 TESTING OF ELECTRICAL SYSTEMS

.1 General

.1 Prior to the Engineer’s acceptance, all electrical equipment, materials and systems installed shall be subject to an inspection and applicable performance tests supervised by the Engineer to ensure that the operation of the system and components satisfy the requirements of the Specifications.

.2 Ensure that the system and its components are ready prior to the inspection and test for acceptance.

.3 All testing shall be conducted by fully qualified personnel only. Tests requiring initial power energization of a system shall not be made without notification of the Engineer. Tests, checks and the like carried out by or on behalf of the Contractor shall be documented and certified at no additional cost to the Owner.

.4 Carefully check wiring for each system and/or part of a system to ensure that the system will function properly as indicated by wiring and schematic diagrams, description of operation, etc.

.5 Manually operate alarms and control devices to check whether their operation during normal and abnormal operating conditions causes the proper effect.

.6 In addition to tests on purely electrical systems, supply the necessary labour and equipment for operational tests required by other Divisions where electrical services are involved and make final adjustments to the electrical controls at no additional cost to the Owner.

.7 Perform tests on auxiliary or specialized systems with the assistance of the manufacturer's representative. Upon successful conclusion of the tests, obtain a certificate from the manufacturer stating that the system has been installed to their satisfaction and that it is in good working order.

.8 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to values and settings as indicated.

.2 Conduct and pay for following tests:

.1 Power distribution system including phasing, voltage, grounding and load balancing.

.2 Circuits originating from branch distribution panels.

.3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.

.4 Process control

.3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.

.4 Insulation resistance testing.

.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.

.3 Check resistance to ground before energizing.

.5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.6 Submit test results for Engineer's review.

.7 Refer to Section 01000.

3.14 CABLE AND WIRE 1000 VOLT AND BELOW

.1 Tests on cables in this voltage range shall be limited to insulation resistance measurements using a 500V megger for systems up to 350V and a 1000V megger for 351-600V systems.

.2 All testing to be completed prior to connection of equipment, with cable ends suitably isolated to prevent accidental contact with equipment. Under no circumstances shall testing be completed with wires/cables connected.

.3 Record all test results in a log book and submit to the Engineer for reference. Replace or repair all circuits, which do not meet minimum requirements specified in the Electrical Code, Table 24. Insulation resistance of the following circuits shall be measured:

.1 Power, lighting and motor feeders: phase-to- phase, phase-to-neutral and phase-to- ground.

.2 Control circuits: measure to ground only.

3.15 GROUNDING SYSTEM

.1 Test the grounding system efficacy for compliance with the Electrical Code and the Supply Authority requirements. Record the resistance of each ground electrode group. Report the test results to the Engineer for review and approval prior to energizing the system.

.2 Notify Inspection and Supply Authorities so that they may be present to witness Contractor testing, and provide any assistance required by these Authorities for their own testing procedures.

.3 Visual and Mechanical Inspection

.1 Inspect expose ground conductor and connections.

.2 Inspect ground rod viewport.

.3 Dig to expose to underground ground rods and connections, review condition

.4 Ensure proper connections are made to all exposed switchgear, structures, transformers, fences, gates, and other items per OESC section 36.

.4 Electrical Tests

.1 Perform fall of potential or alternative test in accordance with IEEE Standard 81 on the main grounding electrode or system.

.2 Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.

.5 Test Values

.1 The resistance between the main grounding electrode and ground should be no greater than five ohms for commercial or industrial systems and one ohm or less for generating or transmission station grounds unless otherwise specified by CNL. (Reference ANSI/IEEE Standard 142)

.2 Investigate point-to-point resistance values which exceed 0.5 ohm.

3.16 TRAINING

.1 Provide for the training of the Owner's representatives in the operation, maintenance and testing of all systems and equipment including the provision of qualified manufacturer's technical representatives for specialized systems.

3.17 DELIVERY AND STORAGE

.1 Ship and store equipment as per manufacturer’s recommendations.

.2 Ship channel bases and anchor stencils in advance of equipment.

.3 Keep equipment doors locked. Protect equipment from damage, dust and weather during shipping and storage.

.4 Block moving parts when necessary to prevent damage during movement and shipment of equipment. Instructions to remove blocking before putting equipment in service to be clearly and conspicuously displayed.

.5 Store all electrical equipment indoors. Temperature sensitive equipment to be stored in heated spaces. All equipment shall be stored to manufactures recommendations.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All Sections of all Divisions of the Specifications and these Documents inclusive form part of the Contract Documents.

.4 All wire and cable shall have CSA, cUL, or cETL certification.

1.2 SCOPE

.1 Refer to Section 26 05 00 and electrical drawings for project scope of work.

.2 Furnish all labour, materials, supervision, equipment and services specified herein, indicated or requested to install the complete wiring systems including, but not limited to:

.1 Low voltage wire and cable (1000V and below)

.2 Control wiring

.3 The wiring system shall include all wiring, terminations, wire markers, cable tags, cable ties, splice fittings, insulating tapes, connectors and miscellaneous materials necessary to complete the wiring system both functionally, and to the Electrical Code.

1.3 REFERENCES

.1 Follow TIA/EIA-568 standards and best practices of structured cabling.

Part 2 Products

2.1 LOW VOLTAGE WIRE 1000 VOLT AND BELOW

.1 All wire shall have stranded, annealed copper, cross linked polyethylene (XLPE) insulation, minus 40°C, 90°C maximum conductor temperature, limited flame spread.

.2 Except where otherwise stated, the minimum conductor insulation rating shall be equal to or greater than the highest voltage to which the insulation may be exposed, but in no case less than 300V.

.3 The wiring shall be suitable for installation in wet environment and rated RW 90.

.4 Wiring in hazardous locations shall be suitable for the area and shall be provided with seals to Code.

.5 For direct buried installations, or for installation in direct buried polyethylene pipe, the cable shall be cross linked polyethylene.

.6 Minimum conductor size shall be #12 AWG unless otherwise specified. #14 AWG copper may be used for control wiring.

.7 Use GTF fixture wire, 600-volt, 125°C, flexible copper conductor for all connections between lighting fixtures and outlet boxes.

.8 Colour coding of insulated conductors shall conform to the following:

Single Phase Systems

Phase A	Red
Phase B	Black
Neutral	White
Ground	Green

Three Phase Four Wire Systems

Phase A	Red
Phase B	Black
Phase C	Blue
Neutral	White
Ground	Green

.9 Insulated ground conductors forming part of a multi-conductor cable assembly shall have green colour coding.

.10 Cable and wire shall be as manufactured by:

.1 For copper: Nexans Canada, Phillips Cables Ltd., Prysmian FP, General Cable Inc., Southwire

2.2 TECK CABLE

.1 Conductors:

.1 Grounding conductor: copper

.2 Circuit conductors: copper, size as indicated

.2 Insulation:

.1 Chemically cross-linked thermosetting polyethylene rated 600-volt

.1 RW90 for normal and wet locations

.2 RWU90 for buried locations

.3 Inner Jacket: polyvinyl chloride material (Teck cable)

.4 Armor: interlocking aluminum

.5 Overall covering PVC material, colour black, flame retardant, FT4 rated, AG14.

.6 Fastenings:

.1 One-hole straps to secure surface cables 50 mm and smaller. Two-hole straps for cables larger than 50 mm. All straps to have inert spacers between spacer and concrete.

.2 Channel type supports for two or more cables.

.3 Minimum 3/8" (6mm) diameter threaded rods, or larger per manufacturer’s guidelines to support the load carried upon suspended channels.

.4 All fastenings and supports must:

.1 Suit the environment in which they are installed, per Electrical Code, and as outlined in section 26 05 00

.2 Be compatible with the strut, channel, and/or cable tray with which they are in contact per the manufacturer's instructions

.7 Connectors:

.1 Watertight approved for Teck cables.

.2 Suitable for hazardous location, as required.

.8 Lugs:

.1 Listed by CSA, cUL, or ETL for use with Copper conductors and sized to accept conductors of the ampacity specified.

2.3 ETHERNET CABLING

.1 All Ethernet cabling shall be CAT 6, round, unshielded, unless otherwise specified. Where field-installed terminations must be used, they shall use CAT 6 connectors with load bars (separately installed, or integral to the connector).

.2 Conductors may be 24 or 26 AWG. Selected AWG shall be used throughout the project for fixed runs between equipment locations.

.3 Cables for fixed runs between equipment locations shall use solid conductors.

.4 Patch cables, under 10m, between equipment in a given panel, MCC, or from wall outlets to PCs shall use stranded conductors for flexibility.

.5 The tightest bend radius of the cable during and after installation shall be no less than 5 times the cable diameter.

.6 Any Ethernet cable that runs in air circulation spaces (ducts, suspended ceilings, etc.), and is not enclosed in conduit, shall be plenum rated.

.7 8P8C connectors shall be CSA, cUL, or cETL certified. They shall match the cable type (unshielded or shielded).

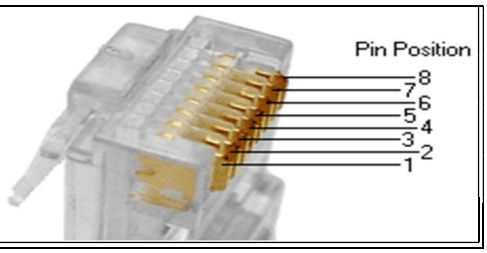
.8 The crimping tool and associated dies shall be selected to match the 8P8C connectors to avoid connector damage during crimping.

.9 Field-terminated 8P8C end connectors shall be selected so that the contact type matches the conductor type. Solid conductors require contacts for solid conductors, and stranded conductors require contacts for stranded conductors; the two types are not interchangeable. A universal style may be used, but shall be explicitly made for universal application.

.10 Factory pre-made and field-terminated cables both shall use the 568A termination pattern as shown:

T568A Pair	T568A Color	Pin	Pin Position
3	 white/green stripe	1	
3	 green solid	2	
2	 white/orange stripe	3	

1	blue solid	4
1	white/blue stripe	5
2	orange solid	6
4	white/brown stripe	7
4	brown solid	8



2.4 WIRING ACCESSORIES

.1 Wire markers, black letters on white background, shall be heat shrink type as manufactured by Critchley or Brady.

.2 Cable markers for cables or conductors greater than 13 mm (1/2 inch) diameter, shall be strap-on type, rigid PVC, black letters on white background.

.3 Terminal blocks shall be minimum 600-volt rated, modular, sized to accommodate conductor size used, as manufactured by Weidmuller, Phoenix Contact, Allen-Bradley.

.4 Where screw-type terminals are provided on equipment, field wiring shall be terminated with insulated fork tongue terminals, as manufactured by Thomas & Betts, Sta-Kon.

.5 Cable ties shall be nylon, one-piece, self-locking type, as manufactured by Thomas & Betts, Burndy, Electrovert.

.6 Electrical insulating tape as manufactured by 3M Scotch 88.

.7 Cable grips shall be provided for all vertical and catenary cable suspension installations to reduce cable tension at connectors or at cable bends. The cable grips shall be selected to accommodate the type and geometry of cable supported and shall be of the single weave, variable mesh design, as manufactured by Kellems, Arrow-Hart.

.8 Cable pulling lubricant shall be compatible with cable covering and shall not cause damage and corrosion to conduits or ducts.

2.5 CONTROL CABLES

.1 Control wiring for digital functions shall be 16 AWG with 600 Volt insulation.

.2 Control wiring for analog functions shall be 16 AWG minimum with 600 Volts insulation, individual and overall twisted and shielded, 2 or 3 wire to match analog function hardware.

.3 Sensor wiring shall be 16 AWG minimum twisted and shielded, 2 or 3 wire to match analog function hardware or 16 AWG as required by code.

.4 Acceptable manufacturer shall be Belden Instrumentation ACIC cables or approved equal.

Part 3 Execution

3.1 INSTALLATION

.1 Wiring shall be concealed in finished areas, on the building exterior masonry, and other locations where it would foreseeably be considered unsightly. Wiring may be surface mounted in service spaces and process areas.

.2 Install all wire according to the drawings.

.3 Install wire into ducts, cable trays, and conduits in accordance with the manufacturer's recommendations, using patented wire grips suitable for the type of wire or using pulling eyes to be installed directly onto the conductors.

.4 Limit pulling tensions to those recommended by the manufacturer to avoid overstressing wire.

.5 Utilize adequate lubricant when pulling wires through ducts and conduits to minimize wear on cable jackets.

.6 Make connections to equipment "pig-tails" with mechanical, insulated, screw-on connectors for wire sizes #14-10 AWG. For wire sizes #8 AWG and larger utilize split-bolt connectors, taped with three layers minimum of insulating tape. For both copper and aluminium terminations, wire through the conductor, apply joint compound anti-oxidant, and torque to lug manufacturer’s recommended torque levels.

.7 No splices shall be permitted in cable or wiring runs without the written permission of the Engineer and shall only be permitted in junction boxes.

.8 Neutral conductors shall be identified. Paint or other means of colouring the insulation shall not be used.

.9 Unless otherwise specified, make all wiring taps, splices and terminations with identified compression screw type terminal blocks, securely fastened to avoid loosening under vibration or normal strain. Make connections for interior and exterior lighting circuits and 120-volt, 15-amp convenience receptacle circuits using screw-on or split-bolt connectors and insulating tape.

.10 Determine the exact length of cable required to avoid splices.

.11 Fasten cable runs with Stainless-Steel cable clamps or Stainless-Steel cable ties according to NEMA VE 2.

.12 Identify each conductor by specified markers at each termination indicating the circuit designation or wire number.

3.2 WIRING IDENTIFICATION

.1 Provide permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. Maintain phase sequence and identification throughout system, i.e., panelboards, starters, terminal blocks, disconnect switches.

.2 All control system wiring to be labeled using permanent heat-shrink wire labels, labels to be installed at each termination point. Wire labels to match control system wiring diagrams produced by successful control panel manufacturer defined in Section 25 14 23.

.3 Maintain identification system at all junction boxes, splitters, cabinets and outlet boxes.

.4 Use colour coded wires in communication cables, matched throughout system. All colour coding must adhere to the Electrical Code.

3.3 CABLE IDENTIFICATION

.1 Identify each cable by attaching a suitable marker, stamped or indelibly marked with the cable number, at each end of the cable and in all junction boxes and pull boxes.

.2 Provide cable schedule for all cables installed. Match cable identifications as installed on site. Provide cable length on cable schedule and include with O&Ms and Record Drawings.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Refer to Section 26 05 00 for project electrical scope of work.

.2 The work for ground plate shall include the work to install ground plates, and the associated work described in this specification

.3 Furnish all labour, materials, equipment and services specified, indicated or requested to install a complete grounding system. The grounding system shall include ground plate, all wiring, thermit welds, links and miscellaneous materials necessary to complete a grounding system acceptable to the Inspection Authorities.

1.3 SHOP DRAWINGS

.1 Shop drawings shall include but not be limited to the following, as applicable:

.1 Ground plate.

.2 Thermit weld kits.

1.4 QUALITY ASSURANCE

.1 Grounding equipment to the current revision of CSA C22.2 No. 41.

Part 2 Products

2.1 GENERAL

.1 The installation of ground electrodes shall be according to the Ontario Electrical Safety Code.

2.2 GROUND AND BONDING CONDUCTORS

.1 Conductors shall be concentric stranded, soft drawn copper. Insulated conductors shall be type RW90, 600-volt rating, green colour, and shall meet the same flame-spread requirements of all wiring in the area and conditions where they are installed. Where installed underground the insulation shall be rated RWU90.

.2 Conductors shall be sized at least per the requirements of the latest version of the Canadian Electrical Code and of the local Authority, or as indicated, whichever is the greater size.

.3 Where direct buried bare ground conductor comes into contact with corrosive material, the conductor shall be tinned.

2.3 GROUND PLATE

.1 Ground plate shall be minimum 600mmx600mmx6.35mm or as specified on drawings, whichever is more stringent.

.2 Ground plates shall be copper clad steel construction with the copper exterior coating permanently bonded to the steel core.

2.4 THERMIT WELD CONNECTIONS

.1 Where a ground rod network is used for grounding, connections between the rods and the grounding conductor shall be of a CSA, cUL, or cETL certified thermit weld type connection by T&B, Burndy, Erico.

.2 Provide and use new thermit weld mold kit for the project. Submit shop drawing for new thermit weld kit.

.3 Thermit connection shall be used for all buried connections.

Part 3 Execution

3.1 INSTALLATION

.1 The Contractor shall excavate a minimum depth of 0.6 m at ground plate location.

.2 Ground plates shall be installed vertically (not flat) and shall be installed on a minimum 150 mm thick compacted bed of suitable native earth materials

.3 Make all other buried or encased conductor joints, splices and connections with permanent-type thermit welds.

.4 The resistance to ground of the grounding grid shall be tested and measured. In soils of low conductivity, additional ground plates, and ground wires shall be added as required by the Engineer or the Electrical Safety Authority.

.5 These measurements shall be undertaken under dry soil conditions, and when frost penetration has not exceeded 150 mm. Readings shall not exceed 25 ohms.

3.2 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to the following list: service equipment, transformers, switchgear, duct systems, frames of motors, motor control centres, starters, control panels, building steelwork, distribution panels, outdoor lighting, telephone backboard.

3.3 TESTS

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the Engineer and inspection authority having jurisdiction.

.3 Perform tests, submit reports, and obtain approval of the Engineer before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

.5 Notify Engineer a minimum of 1 week before performing tests. Perform tests in presence of the Engineer.

.6 Submit written test results to the Engineer and include in the O&M Manual.

.7 Take measurement and several quality photographs of routing immediately prior to back filling. Use wide shots, close shots, and capture enough features so that conduit location can be approximately determined after construction is complete. Include photos in O&M Manual. Mark grounding location on As Builts and include dimensions.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 This section covers the supply and installation of all fastenings and supports for equipment mounted under the electrical scope of work.

.2 Significant supports shall be arranged by the Contractor. A sketch will be sent to the Engineer ahead of time. Revise as requested by the Engineer.

Part 2 Products

2.1 MATERIALS

.1 Expansive screw anchors, shields, or other fastening items containing lead or other material that might loosen or melt under fire conditions shall not be used.

.2 Fastenings, supports, and associated hardware shall be of the following materials, dependent upon location conditions and loads to be supported:

- .1 Category 1 wet or humid: Aluminum or hot dip galvanized steel.
- .2 Category 2 corrosive: Stainless steel, or aluminum, or, for light loads not exposed to mechanical injury or direct heat, fiberglass.
- .3 Normal (neither Category 1 or 2): Aluminum or hot dip galvanized steel.

.3 Fastenings and supports (including channels), and their associated hardware shall be made of the same materials to reduce corrosion potential.

.4 Powder-actuated fasteners and devices shall not be used.

.5 Support channels, length as required, U-shaped, size as required by carried load, or manufacturer's recommendations.

.6 Support equipment, conduit or cable clips, spring loaded bolts, cable clamps etc., to be purpose-built accessories for standard channel members.

.7 In ordinary areas, for individual (ungrouped) conduit:

- .1 Two-hole conduit straps for conduits 35 mm and larger.
- .2 One-hole conduit straps for conduit smaller than 35 mm.

.8 Beam clamps to secure conduit to exposed steel work.

.9 Provide Unistrut channel supports to support local wiring, disconnect switches, control stations, or other devices in areas that are not adjacent to a suitable mounting structure. Supports shall be rigid.

.10 Acceptable manufacturers: Burndy, Unistrut or approved equal.

Part 3 Execution

3.1 INSTALLATION

.1 Install fastenings and supports as required for each type of equipment, cables and conduit to manufacturer's installation recommendations.

.2 Group equipment, conduits, and cables to the extent practicable.

.3 Support cables or conduits in groups on channels.

.4 Support cables or conduits in wet locations on channels.

.5 Attach channels to structure where suitable, or support by 6.0 mm diameter threaded rod hangers otherwise. Use larger diameter rod and hangers where the carried load or manufacturer’s recommendations require.

.6 Provide metal brackets, frames, hangers, clamps and related support structures where indicated or as required to support conduit and cable runs.

.7 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.8 Provide adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.9 Do not use supports of other equipment installed for conduit or cable support except with permission and approval of the Engineer.

.10 Any aluminum support bracket or channel that is in direct contact with concrete is required to have inert spacers to reduce chemical reaction between support and concrete.

.11 Run sport systems parallel or perpendicular to building lines.

.12 Coordinate locations of all support systems with other trades to ensure proper installation of equipment.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Furnish all labour, materials, equipment and services specified, indicated or requested to install the electrical boxes specified herein and on the drawings.

Part 2 Products

2.1 OUTLET BOXES

.1 Size boxes in accordance with the Electrical Code.

.2 100 mm square or larger outlet boxes as required for special devices.

.3 Gang boxes where wiring devices are grouped.

.4 Provide barriers where outlets for more then one system are grouped.

.5 Blank cover plates for boxes without wiring devices.

.6 All outlet boxes shall be supplied with ground stud.

.7 Surface mounted outlet and switch boxes shall be:

- .1 PVC
- .2 Ipex F-Series or equivalent.
- .3 To CSA C22.2 No. 18.2-06 (R2011) Non-metallic Outlet Boxes.

.8 Flush-mounted outlet boxes for the office areas shall:

- .1 Be galvanized steel.
- .2 Be to CSA C22.2 NO. 18.1-13 – Metallic Outlet Boxes.

.9 In wet locations, boxes and fitting shall be weatherproof.

.10 In corrosive locations, boxes and fitting shall be corrosion-resistant.

.11 In hazardous locations, boxes and fittings shall be explosion proof, flameproof, or otherwise suitably rated, where required.

.12 In all areas electrical equipment shall be sprinkler proof.

Part 3 Execution

3.1 INSTALLATION

.1 Equipment shall be surface mounted only in service spaces and process areas. Do not install surface mount on the building exterior or on any ramp wall.

.2 Install boxes to clear all building and mechanical services equipment. Where two or more devices are shown at one location, utilize multi-gang boxes. Supply all outlet boxes with covers as required.

.3 Size all boxes to accommodate the number of conduits, conductors and terminal blocks. Provide junction boxes with 20% spare terminal blocks.

.4 Securely fasten surface-mounted boxes to the building or mounting structure and support independently of the conduits entering the box.

.5 Securely fasten flush-mounted boxes to supporting studs or wall structure and support independently of the conduit or cables entering the box.

.6 Install junction and pull boxes mounted on brick, concrete or block walls with 3 mm (1/8 inch) thick lead or nylon washers between box and wall face.

.7 Provide pull boxes sized to Electrical Code requirements, in all conduit raceway systems to limit length of straight conduit runs to 30 m (100 ft). Reduce this length by 7.5 m (25 ft) for each 90 degrees bend or 4 m (12 ft) for each 45-degree bend or offset.

.8 Mark location and size of all pull boxes on the record drawings.

3.2 APPLICATION

.1 Location of outlets indicated may be changed by the Engineer at no extra cost or credit, providing distance moved does not exceed 3000 mm, and notice is given before installation is completed.

3.3 MOUNTING HEIGHTS

.1 Refer to Section 26 05 00.

.2 Exact mounting height of unnoted equipment must be verified with the Engineer before proceeding with installation.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Refer to Section 26 05 00 for project electrical scope of work.

.2 This section covers the supply and installation of all wire and box connectors.

1.3 QUALITY ASSURANCE

.1 Wire connectors and solder lugs to CSA C22.2 No. 65-13.

.2 Connectors shall be copper or copper alloy and appropriate for the wire.

.3 Clamps or connectors for cable to CSA-C22.2 No. 18-06.

Part 2 Products

2.1 MATERIALS

.1 All lugs, terminals and screws used for termination of wiring must be suitable for the conductors.

.2 Clamps or connectors for flexible conduit, as required.

.3 All cable terminations shall be with compression type connectors.

.4 Connectors shall be suitable for the area classification they are installed in.

.5 Connectors shall be rated for hazardous location where required.

Part 3 Execution

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65-13.

.3 Install fixture type connectors and tighten. Replace insulating cap.

.4 Install crimp type connectors to the satisfaction of the Engineer.

.5 Install box connectors to CSA requirements.

.6 Seal connections against passage of humidity or vapor.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Furnish all labour, materials, supervision, equipment and services specified, indicated or requested to install a complete conduit raceway system. The raceway systems shall be comprised of the supply and installation of all conduits, fittings, supports, hangers and miscellaneous support materials and hardware required.

1.3 SHOP DRAWINGS

.1 Submit shop drawing for epoxy coated rigid metal conduit. Include vendor contact information.

1.4 QUALITY ASSURANCE

.1 Shall meet the current edition of the standards listed below:

.1 Rigid PVC (Unplasticized) conduit to CSA C22.2 No. 211.2.

.2 Liquid-tight flexible metal conduit to CSA C22.2 No. 56.

.3 Rigid galvanized steel and epoxy coated conduit to CSA C22.2 No. 45.1.

.4 Aluminum rigid conduit to CSA C22.2 No. 45.

.5 Electrical metallic tubing (EMT) to CSA 22.2 No. 83.

.6 Electrical non-metallic tubing to CSA C22.2 No. 227.1.

1.5 LOCATION OF CONDUIT

.1 Conceal conduit in finished areas. Generally, mount conduit on surface in service spaces and process areas. Conceal conduit on building exterior where it would be considered unsightly, where there is masonry or other architectural finish, where it is feeding recessed receptacles, etc. Exposed conduit on building exterior is permissible for short runs where it is necessary e.g. service conductors routed to a surface mount enclosure.

.2 Use conduit for systems such as: security, fire alarm, emergency lighting, exit signs, and life safety.

.3 Use conduit where mandatory.

.4 The drawings do not generally show specific conduit runs. Those indicated are in diagrammatic form only.

.5 Electrical contractor shall determine the most efficient rout to run conduits and shall complete all coordination with other trades.

.6 Where tray is used, power wiring for equipment skids, distribution pumps, and chemical feed pumps can be installed on tray. Size tray and lay out wiring to achieve required spacings, or derate the cabling. In these calculations, assume 30% additional wiring is installed, to allow future wiring to be added without impacting existing wiring. Control and instrumentation wiring shall generally be installed in the tray to areas the tray reaches. Provide waterfall dropouts or similar means of maintaining suitable radius for wiring leaving the tray. Power wiring for lighting, receptacles, HVAC, and plumbing shall be generally mounted at walls and ceiling. Raceway in slab shall be installed only where indicated or approved by engineer.

Part 2 Products

2.1 CONDUITS

.1 Minimum size to be 21 mm.

.2 Minimum size for underground runs shall be 27 mm.

.3 Conduit in humid or corrosive environments shall be Rigid PVC.

.4 Conduit in hazardous areas shall be threaded rigid aluminum or threaded rigid epoxy-coated steel conduit with internal corrosion resistant epoxy-covered zinc lining. Minimum size to be 21 mm.

.5 PVC-jacketed, liquid-tight flexible metal conduit for motor and equipment connections.

.6 Where the Engineer approves wiring runs embedded in concrete, utilize Rigid PVC.

2.2 STRUT CHANNEL AND ACCESSORIES

.1 Strut channel and associated accessories shall be of the following materials, dependent upon location conditions and rated for the loads to be supported:

.1 Category 1: Aluminum, or hot dip galvanized steel.

.2 Category 2: Stainless steel, unless susceptible to degradation due to the specific chemicals in the environment, aluminum, unless susceptible to degradation, or fiberglass where not exposed to heavy loads, mechanical injury, or direct heat.

.3 Normal (neither Category 1 or 2): Aluminum or hot dip galvanized steel.

.2 Strut clamps shall be one-piece heavy-duty construction with parallel hook design.

2.3 FITTINGS

.1 Fittings shall be manufactured for use with conduit specified. Materials and coatings shall be same as conduit.

.2 Factory “ells” where 90° bends are required for 25mm and larger conduits.

2.4 EXPANSION FITTINGS FOR PVC CONDUIT

.1 All conduits entering outlet boxes and devices that are in walls subject to movement shall be terminated by means of liquid-tight flexible conduit, approximately 450 mm in length

between the conduit and the outlet box or device which is being supplied. All conduits, bus duct, wireways, etc., passing through or across expansion joints of the building shall be installed with the use of approved expansion fittings.

2.5 FISH CORD

.1 Polypropylene of sufficient diameter and strength to pull in future additional cables.

2.6 UV RATING

.1 All conduits installed above finished grade shall be UV rated where exposed to sunlight or other UV sources for a min of 150 mm below finished grade or not exposed to UV light source

Part 3 Execution

3.1 GENERAL INSTALLATION REQUIREMENTS

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Cut conduit ends square and ream to remove burrs and sharp edges. Ensure that conduits butt in couplings and other fittings.

.3 Bends and offsets shall have a radius of curvature not less than the minimum bending radius of the cable to be installed.

.4 Temporarily plug all conduits terminating in cabinets and boxes where moisture and foreign matter may enter.

.5 Blow all conduits through with clean compressed air to clear all foreign matter and moisture prior to the installation of wires or cables.

.6 Install fish cord in all conduits.

.7 Group exposed conduits together wherever possible and run parallel to building lines, supported from structural members and protected by the flanges of the structural member where practical.

.8 Use manufacturer recommended mounting clips to secure conduit to strut channel.

.9 Support strut channel to structure with suitable fasteners or beam clamps for attaching to structure. Make no holes in building structural members for supporting conduits without the permission of the Engineer. Make holes following the directions of the trade responsible for the structural members. Touch up holes as required so that overall finish is restored.

.10 Provide additional strut channel supports at each elbow and terminations at a box or cabinet.

.11 Perforated metal straps used to support conduits are unacceptable.

.12 Install conduits at least 150 mm (6") clear of all steam pipes and flues, and 1 m (39") clear of heaters. Do not bend over sharp objects or improperly form.

.13 The maximum length of straight conduit run shall be 30 m (100 feet) between pull boxes or other terminations. This length shall be reduced by 10 m (32 feet) for each 90 degree bend or 5 m (16.5 feet) for each 45 degree bend or offset. Conduit runs shall not include more than the equivalent of two 90 degree bends between pull boxes except where indicated otherwise on the drawings.

.14 . Conduits shall NOT be run along the floor without written permission from engineer.

3.2 UNDERGROUND CONDUIT

.1 Installation of conduit in trenches shall generally follow the rules for installation of cable in trenches.

.2 Provide trench, backfill, and surface restoration.

.3 Provide sand bed envelope above and below conduit.

.4 Backfill shall be non-shrink fill, compacted in lifts.

.5 Maintain spacings from other wiring and other services to Code and good practice. Provide spacings to prevent interference between systems.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Furnish all labour, materials, supervision, equipment and services specified, indicated or requested to provide all trenching and backfilling as necessary for the installation of all underground cables, etc., as indicated.

1.3 QUALITY ASSURANCE

.1 Installation of cables in trenches and ducts shall meet the requirements of the current edition of the Canadian Electrical Code CSA C22.1.

Part 2 Products

2.1 TRENCHING AND BACKFILLING

.1 Trenching shall be approximately 1000 mm in depth, width to suit proper installation.

.2 Backfill for trenches for all direct buried cables, ducts, conduits, etc., shall consist of fine sand (minimum 100 mm below and above cables, etc.) and firmly compacted. Sand shall be free of rocks and debris. Backfill finishing material shall be as indicated in Division 31 of the specification.

.3 All direct buried cables, ducts, etc., crossing over each other or over/under other types of underground service shall be encased in wood planks treated with pentachlorophenol.

.4 Frozen earth, large lumps or boulders shall not be used for backfill material.

.5 Provide treated wood planks meeting approved wood treatment materials over all buried cables, etc., under existing or future roads and sidewalks.

.6 Provide sleeves under all parking, concrete and traffic areas for cables.

.7 Where cables enter building provide a vertical 100 x 250 mm white sign with black wording ELECTRICAL CABLES securely fastened to the exterior of the building wall approximately 300 mm above finished grade.

2.2 CABLE PROTECTION

.1 Provide identification tape labelled as indicated showing location of direct buried cables.

Part 3 Execution

3.1 BURIED SYSTEMS

.1 Meet all spacing requirements for underground systems to Codes and good practices.

.2 Adhere to Electrical Code including Section 12 and Section 60.

.3 Adhere to CSA C22.3 No.7 Underground Systems.

3.2 DIRECT BURIAL OF CABLES

.1 Do not install cables in areas of recent excavation and backfill that are prone to settling or sloughing which will strain the cables. Backfilling with non shrink fill, backfilling in lifts, and adequately compacting each lift is normally adequate.

.2 After specified sand bed is in place, lay cables in trench, maintaining a 75 mm minimum clearance from each side of trench to nearest cable. Do not pull cable into trench.

.3 Provide offsets for thermal action and minor earth movements. Offset cables 150 mm for each 60 metres of run, maintaining minimum cable separation and bending radius requirements.

.4 Underground cable splices are not acceptable.

.5 Minimum permitted radius at cable bends for rubber, plastic or lead covered cables, 8 times diameter of cable; for metallic armoured cables, 12 times diameter of cables or in accordance with manufacturer's instructions.

.6 Maintain 190 mm minimum separation between cables of different circuits. Maintain 300 mm horizontal separation between low and high voltage cables. When low voltage cables cross high voltage cables maintain 300 mm vertical separation with low voltage cables in upper position. At crossover, maintain 75 mm minimum vertical separation between low voltage cables and 190 mm between high voltage cables. Maintain 300 mm minimum lateral and vertical separation for fire alarm and control cables when crossing other cables with fire alarm and control cables in upper position. Install treated planks on lower cables 600 mm in each direction at crossings.

.7 After sand protective cover is in place, install continuous row of overlapping 38 x 140 mm pressure treated planks as indicated to cover length of run.

.8 Repair, replace or make good all trenching to asphalt, concrete, gravel or sod surfaces to the satisfaction of owner.

3.3 FIELD QUALITY CONTROL

.1 Provide digital photographs of each phase of the installation, photographs to include standard reference point on site to provide spatial relationship of the photograph. Photograph phases to include at minimum open trench, first layer of sand, cable installation, second layer of sand, protective planking, first layer of clean fill, marking tape and final layer of fill.

.2 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

.3 Perform tests using qualified personnel. Provide necessary instruments and equipment.

.4 Check phase rotation and identify each phase conductor of each feeder.

.5 Check each feeder for continuity, short circuits and grounds. Ensure resistance to ground of circuits is not less than 50 Mega Ohms.

3.4 PRE-ACCEPTANCE TESTS.

.1 After installing cable but before terminating, perform insulation resistance test with 1000V megger on each phase conductor.

.2 Provide Consultant with list of test results showing location at which each test was made, circuit tested and result of each test.

.3 Remove and replace entire length of cable if cable fails to meet any of test criteria.

.4 Contractor responsible for making all necessary repairs to installation resulting from improper backfilling, compaction, etc.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Refer to Section 26 05 00 for project electrical scope of work.

.2 This section covers the supply and installation of all receptacles, toggle switches, and cover plates.

.3 All wiring devices shall be at the same manufacturer throughout the Contract.

1.3 SUBMITTALS

.1 Submit shop drawings for all wiring devices in accordance with Section 26 05 00.

Part 2 Products

2.1 RECEPTACLES

.1 This specification applies to single and duplex receptacles and receptacles of other voltage and ampacity as indicated on the drawings.

.2 Type NEMA 5-15R or 5-20R as the circuit requires, 125V, U-ground, heavy duty specification grade to the current edition of CSA C22.2 No. 42 – General Use Receptacles.

.3 Receptacle shall have heavy duty nylon face with steel reinforcing plate in centre.

.4 Receptacle shall have spring loaded back wiring.

.5 Receptacle shall have raised ground for safety.

.6 Receptacle contacts shall have spring steel clips to reduce contact fatigue.

.7 Receptacle shall be suitable for No. 10 AWG back and side wiring.

.8 All screws shall be combination slotted socket head design to accept #6 socket head screwdriver on all screws.

.9 Provide ground fault circuit interrupter receptacle (GFCI) where indicated on plan drawings. GFCI receptacle shall be complete with:

.1 Testing and reset buttons.

.2 Indicator light to show status of GFCI protection operation.

.3 Solid state ground sensing device.

.4 5mA trip level.

.10 Provide Industrial Extra Heavy – Duty corrosion resistance receptacles in humid & corrosive location (Category 1 and 2).

.11 Receptacles in ordinary and humid corrosive locations shall be duplex-type, manufactured by Bryant, Cooper, Arrow Hart, Leviton.

.12 Receptacles in Zone 1 and Zone 2 hazardous locations shall be manufactured by Crouse-Hinds ENR (M3) Explosion-proof Receptacles, Meltric.

2.2 SWITCHES

.1 Switches shall be 15A, 120V, single pole, double pole, or three-way as indicated on the drawings.

.2 Must adhere to CSA 22.2 No. 111-10 (R2015) – General-use Snap Switches, unless specified for use in hazardous areas.

.3 Switches to be manually-operated heavy duty with the following features:

.1 Heavy duty mounting strap

.2 One piece Lexan toggle, lever, and cam

.3 Silver alloy contacts

.4 Spring loaded back wired

.5 Green hex head grounding terminal

.6 All screws socket/slotted head suited to accommodate #6 socket head screwdriver

.7 Switches to be fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.

.4 Switches in ordinary and humid corrosive locations shall be manufactured by Bryant, Cooper, Crouse-Hinds, Leviton. Type 1201 (number to suit application and amperage).

.5 Switches in Zone 2 hazardous locations shall be manufactured by Crouse-Hinds No. EFS/EFD (number to suit application and amperage) or approved equal.

2.3 COVER PLATES

.1 Cover plates from one manufacturer throughout project to match switches and receptacles.

.2 Cover plates to be PVC.

.3 For wiring devices mounted in flush-mounted outlet boxes, thickness to be 2.5 mm.

.4 Cover plates shall be suitable for Ipex FS/FD boxes.

.5 Acceptable manufacturer is Ipex.

2.4 WEATHERPROOF COVER PLATES

.1 Weatherproof covers for duplex receptacles located indoors, for Category 1 and Category 2 areas or all process areas, shall be self-closing, two independent spring-loaded self-

closing doors, PVC complete with non-corrosion stainless steel springs and stainless steel mounting screws.

.2 Weatherproof covers for duplex receptacles located outdoors shall be weatherproof-in-use type.

.3 Weatherproof covers for light switches shall be plunger style, PVC complete with non-corrosive stainless steel mounting screws.

.4 Cover plates for receptacles in areas exposed to the weather shall have while-in-use covers.

.5 Covers shall be complete with EPDM gasket material suitable for –45°C to 85°C.

.6 Acceptable manufacturers are IPEX, Leviton, Crouse-Hinds, Hubbell.

Part 3 Execution

3.1 INSTALLATION

.1 Switches:

.1 Install single throw switches with handle in "UP" position when switch is closed.

.2 Utilize gang type outlet box where more than one switch is required in one location.

.3 Mount toggle switches at height specified in Section 26 05 00 or as indicated.

.2 Receptacles:

.1 Mount duplex receptacles vertically unless otherwise noted.

.2 Install receptacles in gang type outlet box when more than one receptacle is required in one location.

.3 Mount receptacles at height specified in Section 26 05 00 or as indicated.

.4 The location of all outlets as shown on the electrical plans is approximately correct at the time of planning, but as these drawings do not show all structural details, measure any work requiring accurate dimensions either on the project or from the architectural details.

.5 The location of outlets shown on the drawings may be changed by the Engineer at no extra cost to the Owner, providing the distance does not exceed 3000 mm and the information is given before installation.

.3 Cover Plates:

.1 Install all cover plates prior to energization.

.2 Cover plates shall be straight and true.

.3 Install suitable common cover plates where wiring devices are grouped.

.4 Flush-mounted cover plates shall be flush with the wall.

.5 Do not use cover plates meant for flush-mounted outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Refer to Section 26 05 00 for project electrical scope of work.

.2 This section covers the supply and installation of all magnetic and thermal magnetic circuit breakers.

.3 Specific circuit breaker voltage, phase, ampacity, pole numbers, interrupting capacity, breaker type and settings are indicated elsewhere in the specifications or on the drawings.

1.3 QUALITY ASSURANCE

.1 All equipment to the current edition of CSA Standard C22.2, No. 5 – Molded-case Circuit Breakers.

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 26 05 00 and Section 01000, including:

- .1 Component function, make and model no.
- .2 Quantities.
- .3 All electrical and physical ratings and features.
- .4 Breaker voltage and amperage.
- .5 Withstand and interrupt capability, with and without the series ratings that would apply.
- .6 Breaker phase, number of poles & number of wires.
- .7 Adjustments.
- .8 Indication of solid neutral if required.
- .9 Lug information.

.2 Submit time-current curves for breakers.

Part 2 Products

2.1 BREAKERS - GENERAL

.1 Moulded case circuit breakers, quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.

.2 Common-trip breakers with single handle for multi-pole applications.

.3 Magnetic instantaneous trip elements in circuit breakers are to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to have an adjustable range from 3-10 times current rating.

.4 Circuit breakers with interchangeable trips as indicated.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping.

2.3 MAGNETIC BREAKERS

.1 Magnetic circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection (motor starters).

2.4 ENCLOSURES

.1 All breakers shall be housed in panelboards, motor panels, wall mounted enclosures, or MCC; said panels and enclosures to be rated as indicated for the areas in which they are installed.

2.5 MANUFACTURERS

.1 All breakers shall be of the same manufacturer as the panel.

.2 For circuit breakers protecting fans, heating elements, transformers and panelboards, acceptable manufacturer(s): Schneider Canada, Federal Pioneer FHL, Cutler-Hammer Series C, Siemens Sentron.

.3 For circuit breakers protecting electric motors, acceptable manufacturer(s): Schneider Canada Square “D” Mag-Guard MCP, Cutler-Hammer Series C HMCP, Allen Bradley-Bulletin 140U, Frame I, JD or K, Siemens Sentron MCP.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 GENERAL CONDITIONS

.1 All Sections of General Conditions form a part of this Specification. They shall be read and fully adhered to exactly as if repeated here in full.

.2 Refer to all other Divisions of the Specifications and these Documents to determine their effect upon the work of this Section.

.3 All sections of all the Divisions of the Specification and all other documents included as part of this document form part of the Contract Documents.

1.2 SCOPE

.1 Refer to Section 26 05 00 for project electrical Scope of Work.

.2 This section covers the supply and installation of all surge protective devices.

1.3 STANDARDS

.1 The specified system shall be designed, manufactured, tested and installed in compliance with the current edition of the following codes and standards.

.1 Underwriters Laboratories UL 1283 and UL 1449

.2 Canadian Standards: cUL, CSA, ETL.

.3 Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.11, C62.41, C62.45)

.4 C22.1 Canadian Electrical Code

1.4 SUBMITTALS

.1 Submit shop drawings in accordance with Section 26 05 00 including:

.1 Unit dimensions, mass, installation instruction details and wiring configuration.

.2 Voltage, IEEE let through voltage for each waveform listed, UL 1449 latest revision, latest edition, suppressed voltage ratings, per mode and per phase peak surge current, modes of discrete suppression circuitry, warranty period and replacement terms, conductor size, conductor type and lead length.

.3 List and detail all protection systems such as fuses, disconnecting means and protective features.

.4 Provide verification that the Surge Suppressor device complies with the required UL 1449, and UL1283, latest editions, latest revisions, and CSA, or cUL, or ETL approvals.

.5 Provide actual let through voltage test data in the form of oscillograph results for the ANSI/IEEE C62.41 Categories C, B, and A (as indicated on the drawings), tested in accordance with ANSI/IEEE C62.45.

.6 Provide test report from a recognized independent testing laboratory verifying the suppressor components can survive published surge current rating on a per phase mode basis using the IEEE C 62.41, 8x20 microsecond current wave. Test data must be on a complete SPD with internal fusing in place. Test data on an individual module is not acceptable.

Part 2 Product

2.1 GENERAL PRODUCT

.1 The surge protective devices (SPD) described by this specification are to be installed in the various locations .

.2 All SPD devices shall be listed under UL 1449 and certified by CSA, cUL, ETL.

.3 SPD device enclosure shall be rated NEMA 3R.

.4 The SPD shall protect all modes L-G, L-N, and N-G, have discrete suppression circuitry in L-G, L-N and N-G, and have bi-directional, positive, and negative impulse protection. Line-to-neutral-to-ground protection is not acceptable where line-to-ground is specified, and accordingly reduced mode units with suppression circuitry built into only 4 modes are not acceptable.

.5 The maximum continuous operating voltage (MCOV) of all components shall not be less than 125% for a 120V system and 120% for 220V and 240V systems, and 115% for 277V and 600V systems.

.6 All SPDs shall be equipped with a comprehensive monitoring system which shall include a visual LCD panel display providing information on unit status and phase loss/protection loss.

.7 Internal Fusing – Overcurrent Protection:

.1 Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Overcurrent fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode overcurrent fusing is not acceptable where there is more than one MOV per mode.

.2 For arc quenching capability, minimization of smoke and contaminates in the event of a failure, and to ensure the safest possible design, all surge components, current carrying paths and fusing shall be packed in fuse grade silica sand.

.3 Fusing shall be present in every mode, including Neutral-to-Ground.

.4 The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied.

.8 Each suppressor shall include Form C dry contacts (N.O. or N.C.) for remote monitoring capability and shall have at minimum an NEMA 12 steel enclosure, sprinkler proof.

.9 Devices are to be installed as indicated.

.10 The SPD shall have an audible alarm, with mute, on front cover.

2.2 ACCEPTABLE MANUFACTURER

.1 MCC: Acceptable manufacturer for the SPD devices shall demonstrate that they meet or exceed the above requirements and include Total Protection Solutions, Leviton, Eaton, Siemens TPS or approved equal.

.2 120/208 Distribution Panel(s): Acceptable manufacturer for the SPD devices shall demonstrate that they meet or exceed the above requirements and include Total Protection Solutions, or approved equal

Part 3 Execution

3.1 INSTALLATION

.1 Install the SPD devices with the shortest possible conductor length. Conductors shall be under 350mm in length where possible. Route cable as straight as practicably possible, with large radius on any required bends. 90-degree bends are not permissible.

.2 Follow the SPD manufacturer's recommended installation practice as outlined in the equipment installation manual. The electrical contractor shall ensure that all neutral conductors are bonded to the system ground at the service entrance or the serving isolation transformer prior to installation of the associated SPD.

.3 Main service entrance units shall be installed on a 30A breaker or, where indicated, shall be installed on a non-fused disconnect switch that meets or exceeds the fault current rating of the switchgear.

.4 Distribution branch panel units shall be installed on 30A dedicated circuit breaker or, where indicated, shall be wired directly to the main lugs or feed through lugs, or wired directly to the bus bars.

.5 The installing contractor shall comply with all applicable codes.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies general clauses applicable to the supply and installation of all process mechanical systems.

.2 The process mechanical systems include all of the systems handling wastewater fluid.

.3 The Work under this section shall include the supply, installation, testing and start-up of all Process Mechanical Material and Products to provide a complete and workable installation in accordance with the contract drawings and specifications and all applicable codes, standards and ordinances. Any work and/or other necessary materials not specifically mentioned in the specifications or shown on the drawings, but necessary to complete the installation, shall be furnished by the Contractor as if specifically mentioned herein and detailed.

1.2 INTENT

.1 The responsibility and scope of each subtrade rests solely with the General Contractor. Extras will not be considered based on the grounds of difference in interpretation of specifications as to which trade involved is to provide certain specifications or materials.

.2 Where errors or discrepancies appear in catalogue numbers, provide the material in accordance with the system requirements and to the standard of the specifications.

.3 Provide complete and fully operational mechanical systems with facilities and services to meet requirements described herein and in complete accord with applicable codes and ordinances.

.4 The specifications are to be considered as an integral part of the drawings which accompany them; neither the drawings nor the specification shall be used alone. Any item omitted from one but which is mentioned or reasonably implied in the other shall be considered as properly and sufficiently specified.

1.3 PERMITS, CERTIFICATES, FEES

.1 The Contractor shall give all notices, obtain all permits and pay all fees so that the work specified herein may be carried out.

.2 The Contractor shall make all necessary arrangements with Utilities Companies for services and meters as required and pay for all the costs involved.

.3 Arrange for inspection of all work by the authorities having jurisdiction over the work including local building, plumbing, and Hydro One Representatives. On completion of the work, present to the Engineer the final unconditional certificate of approval of the inspecting authorities.

1.4 CODES AND STANDARDS

.1 Comply with the requirements of the latest edition of the applicable CSA standards, the requirement of the Authorities, Federal, Provincial and Municipal Codes, the applicable standards of the Underwriters Association and all other Authorities having jurisdiction. Comply with the guidelines of the province of Ontario and City of Dryden in the

undertaking of the work. These codes and regulations constitute an integral part of these specifications.

.2 Conform to the latest edition and supplements of the following for all materials and installations:

.1 National Building Code of Canada and Provincial Building code, as amended by local by-laws and Provincial Statutes.

.2 Codes, Standards, By-laws, Statutes and Manufacturer's Association Specifications, refer to latest revisions thereof at time of calling of bids, unless specifically designated otherwise.

.3 In no instance shall the standard established by the drawings and specifications be reduced by code or otherwise.

.4 Where conflict or discrepancies between Codes, Standards, By-laws, Statutes, Specifications, Drawings, etc. exist, the most stringent requirement to apply.

.5 Installation to conform to good practice such as described in the ASHRAE Handbooks and Standards, and the SMACNA manuals.

.3 Welding shall conform to the ANSI/ASME Power Piping Code and the ASME Boiler and Pressure Vessel Code.

.4 Welders shall be qualified and licensed in Ontario, and welder qualifications shall be in accordance with CSA-Z662.

.5 Welding safety requirements shall be in accordance with CSA-W117.2 - Code for Safety in Welding and Cutting.

1.5 APPROVED ALTERNATIVES

.1 Approval of alternative equipment shall be in accordance with Tender Documents.

.2 Equipment shown on the drawings and specified is the recommended equipment and is to be used unless permission for an approved equivalent alternative is obtained during the Tender process.

1.6 PRODUCT DELIVERY, STORAGE, HANDLING

.1 All materials and equipment shall be delivered, handled and stored subject to the provisions contained herein and according to the manufacturer's recommendations.

.2 Provide temporary storage facilities and heated storage where required for sensitive items such as motors.

.3 Equipment, including pumps and motors, shall not be placed in temporary or final locations in the new structures before a date approved by the Engineer. The date of delivery into the structure shall be commensurate with the construction progress and the suitability, with respect to temperature, humidity, etc. of the building.

.4 Take precautions to maintain equipment in good condition and to avoid corrosion or other damage which may affect the equipment's performance. Provide temporary coatings as required to prevent corrosion.

.5 Leave factory covers in place and prevent entry of foreign materials into working parts of equipment.

.6 Protect members and bearings with plastic covers.

.7 Grease all shafts and sheaves to prevent corrosion.

.8 The Contractor shall recognize the time interval required for complete construction before the structure is suitable for equipment installation. If equipment is manufactured before it is required at the site, the Contractor shall provide suitable heated dry storage space for the equipment, to the approval of the Engineer. All equipment and motors shall be rotated at least weekly during the storage period, and after installation, until the equipment is placed in normal use.

.9 All material damaged or otherwise harmfully affected during delivery, storage, handling or installation shall be replaced by the Contractor at his/her own expense.

1.7 EQUIPMENT SUPPORTS, ANCHORS, BASES

.1 The Contractor shall provide all structural work required for foundation and support of units, foundation bolts, sleeves, washers, nuts, shims and templates to locate bolts.

.2 Anchor bolts shall be set in concrete with one end of the bolt hooked as detailed; or sleeved anchor bolts as detailed may be set in concrete. Expansion type bolts drilled into concrete may not be used in lieu of anchor bolts.

.3 Where grouting is required for bedplates and equipment bases on concrete foundations, the surface of the concrete foundation shall be roughened to provide a bond.

1.8 MATERIALS

.1 Provide new materials and equipment of first class quality, delivered, erected, connected and finished in every detail, and supplied with the acceptance of the Engineer.

.2 Assume responsibility of ensuring that equipment provided performs as specified.

.3 Replace materials or workmanship below specified quality and relocate work wrongly placed.

.4 Materials and equipment installed to new, full weight and of the best quality specified. Use same brand or manufacturer for each specific application. Provide statically and dynamically balanced rotating equipment for minimum vibration and low operating noise levels. Provide balancing certificates if requested by the consultant.

.5 Each major component of equipment to have manufacturer’s name, address, catalogue and serial number in a conspicuous place.

1.9 INSTALLATION

.1 Follow the recommended installation details and procedures for all equipment as found in the supplier's technical data, supplemented by the shop drawings, the contract drawings and the specifications and the directions of the Engineer. Coordinate work with the work of other trades to avoid conflict.

.2 Install mechanical work in advance of concrete pouring as necessary.

.3 Install equipment generally in locations and routes shown, with minimum interference with other services or free space. Remove and replace improperly installed equipment to satisfaction of the Engineer at no extra cost.

.4 Provide labour, material and tools required to install, test and place into operation, a complete mechanical system. Provide additional material for modifications required to correct minor job confliction.

.5 For equipment or material of the same type or classification, install only products of one manufacturer.

.6 Install all equipment with adequate access for inspection and servicing and to provide minimum interferences. Conserve headroom and leave maximum usable space.

.7 Employ only skilled tradesmen properly licensed by the Province of Ontario, for all work requiring tradesmen with special skill.

.8 Motors shall be aligned, shimmed and coupled to fit shafts, to the tolerances given by the manufacturer.

.9 Set equipment in place and install piping, fittings, valves and other items. Make final adjustments in alignment and elevation before securely fastening equipment and other items in place.

.10 Control alignment so that excess forces are not imposed on equipment when piping connections are tightened.

.11 Do not tighten pipes until grout is set.

.12 Tighten so that there are no excessive stresses set up in flanges.

1.10 VIBRATION ISOLATION

.1 Provide vibration isolators for all mechanical motor driven equipment throughout the project, unless specifically noted otherwise. This shall include but not be limited to the emergency generator equipment.

.2 Provide Vibration Isolators as manufactured by Vibro-Acoustics, Vibron or Air Master. All sound and vibration elimination materials are to be supplied by one supplier unless otherwise specified.

.3 Statically and dynamically balance rotating equipment for minimum vibration and low operating noise level.

.4 Provide flexible connectors for pipes to all equipment supported by vibration isolators.

.5 Provide flame proof flexible connectors between fans, heaters, equipment and ducts.

.6 Equipment installed by the Contractor shall operate smoothly without excessive wear, adjustment and attention. Vibration shall not exceed the manufacturer's specified limits for individual products. Vibrations in pumps shall be within acceptable field vibration limits as outlined in the Standards of the Hydraulics Institute.

1.11 GUARDS

.1 Provide vibration free guards on all exposed drives and rotating parts, to meet the requirements of Ontario Workplace Health and Safety.

.2 Guards shall be provided for the emergency generator equipment.

.3 Provide means to permit lubrication, use of test instruments and movements of motors to adjust belt tension.

1.12 MINOR DEVIATIONS

.1 The Contractor shall allow for additional material such as pipe and ducts for modifications that may be required to correct minor conflicts or deviations.

1.13 DRAWINGS

.1 Drawings do not indicate exact architectural, structural, or electrical features. Examine drawings prior to laying out, fabricating, installing or commencing work to ensure no interference exists. Report conflicts to Engineer before proceeding.

1.14 PRIMARY MEASURING ELEMENTS

.1 Install all primary elements specified in Division 25 – Integrated Automation.

1.15 SHOP DRAWINGS

.1 Shop drawings shall be submitted in accordance with Section 01000 and in accordance with the requirements of the various sections of the Contract Documents.

.2 Submit materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalogue material. Do not assume applicable catalogues are available in the Engineer's office. Maintenance and operating manuals are not suitable submitted material.

.3 Clearly mark each sheet of printed submitted material (using arrows, underlining or circling) to show particular sizes, types, model numbers, ratings, capacities and options actually being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special tank linings, pump seals, materials or painting. Clearly cross-reference components against reference in Equipment Schedules.

.4 Submittals to be made in metric units.

.5 Include technical data sufficient to check that equipment meets requirements of drawings and specifications, wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules as applicable. Include all fan and pump curves. Include sound data, where applicable.

.6 Materials incorporated into the work prior to approval of shop drawings shall be removed and replaced at the Engineer's discretion and at the Contractor's expense.

1.16 OPERATION AND MAINTENANCE MANUALS

.1 Submit operation and maintenance manuals in accordance with Section 01000 and in accordance with the requirements of the Contract Documents.

.2 Provide two complete manuals including system description two weeks prior to startup. These are for Owner's and Engineer's review.

.3 Upon completion of performance tests and debugging, provide four (4) complete manuals to the Owner and Engineer.

1.17 MANUFACTURER'S REPRESENTATIVE

.1 Refer to Section 01000 and to other sections of the Contract Documents with regard to start up and check out services by the manufacturers of equipment.

.2 Arrange and pay for field services of Manufacturer's representatives required for instruction on specialized portions of the installation.

1.18 IDENTIFICATION OF EQUIPMENT

.1 Provide a manufacturer's nameplate on each piece of equipment.

1.19 PAINTING

.1 Piping and valves shall be painted in accordance with the designation shown on the drawings and as specified.

1.20 CONTRACT CLOSE-OUT

.1 Refer to Section 01000.

.2 Perform the following items prior to substantial completion inspection:

- .1 Heating systems capable of operating with alarm controls functional and automatic controls in operation generally, but not necessarily finally calibrated.
- .2 Necessary tests on equipment made including those required by authorities and certificates of approval obtained.
- .3 Equipment and piping painted and escutcheons installed.
- .4 Equipment lubricated as per manufacturer's data.
- .5 Warranty forms have been mailed to manufacturer. Provide copy of original warranty for equipment which has warranty period longer than one (1) year.
- .6 Systems chemically cleaned, flushed and potable water systems disinfection.
- .7 Final Operating/Maintenance Manuals submitted. Operating and Maintenance instructions completed.
- .8 Review and ensure access doors are suitably located and equipment easily accessible including plumbing cleanouts.
- .9 Noise and vibration control devices and flexible connections inspected by manufacturer's representative and written report submitted.
- .10 Operations of plumbing systems and fixtures checked and ensure fixtures are solidly supported.
- .11 Fan plenums cleaned, temporary filters removed and permanent filters installed.
- .12 Record drawings submitted.

.3 Prior to substantial performance inspection, provide complete list of items which are either not finished or deficient at the time of the inspection.

.4 Provide declaration in writing, that substantial performance deficiencies and the following items have been completed prior to the total performance inspection:

- .1 Equipment cleaned inside, outside and lubricated.

1.21 MECHANICAL SYSTEMS DEMONSTRATIONS

.1 For a period of one-half (1/2) working day occurring immediately prior to "Substantial Performance" of the mechanical systems, provide the full-time services of competent personnel to instruct assigned members of the owner's staff to the proper operating procedure of all systems, equipment and apparatus included in the mechanical sub-

contract. Do not commence this instructional period until all mechanical systems are complete and proven operational.

.2 During the instructional period, give operation and maintenance instructions on systems and equipment requiring specialized knowledge. Use qualified representatives of manufacturers and sub-trades for these instructions. Ensure the manufacturers and sub-trade representatives are familiar with the systems and provide complete and accurate information.

.3 Instruct and demonstrate the method of preparation of all equipment for seasonal service, such as draining cooling coils and cooling tower.

1.22 CLEANUP

.1 All piping and equipment shall be thoroughly cleaned of dirt, cuttings and other foreign substances.

.2 Disconnect, clean and reconnect whenever necessary for purposes of locating and removing obstructions.

.3 Flush and chlorinate all potable water systems as specified in plumbing codes and where applicable, in accordance with AWWA standards for Disinfection of Facilities.

.4 The Contractor shall provide bacteriological testing showing that pipe cleanliness meets provincial standards prior to placing potable water systems into service.

1.23 EQUIPMENT PROTECTION AND CLEANUP

.1 Protect equipment and materials in storage on site, during and after installation until final acceptance. Leave factory covers in place and take special precautions to prevent entry of foreign material into working parts of piping and duct systems.

.2 Protect equipment with polyethylene covers and crates.

.3 Operate, drain and flush-out bearings and refill with new change of oil before final acceptance.

.4 Thoroughly clean piping, ducts and equipment of dirt, cuttings and other foreign substances.

.5 Protect bearings and shafts during installation. Grease shafts and sleeves to prevent corrosion. Supply and install necessary extended nipples for lubrication purposes.

1.24 LUBRICATION

.1 For all equipment, furnish all lubricants used during testing and trial runs.

.2 Identify lubricants furnished by brand, grade and item of equipment for which it is intended.

.3 Operate, drain and flush out bearings and refill with a new change of oil before completion.

.1 Refer to Section 01000.

.2 Drawings of Record are required for process mechanical revisions.

.3 The Contractor shall maintain, at the site, a separate set of "red line" process mechanical drawings on which he/she shall record all changes and deviations from the original contract plans and specifications.

.1 Refer to Contract Documents for all motor design requirements.

1.27 TEMPORARY HEAT

.1 Refer to Section 01000.

.2 Thoroughly clean and overhaul permanent equipment used during the construction period, replacing worn or damaged parts. Exchange equipment or components operating improperly at final inspection with new equipment or components at no additional cost to the owner.

.3 Use of permanent systems for temporary heat shall not modify the terms of warranty.

.4 Operate heating systems under conditions which ensure no temporary or permanent damage. Operate fans at proper resistance with filters installed. Change filters at regular intervals. Operate with proper safety devices and controls installed and fully operational.

.5 Where air systems are used during temporary heating, provide filter media on return and exhaust air outlets. Clean duct systems which have become dirty. Provide additional sets of filters to replace temporary filters at final inspection.

.1 Pay all royalties and licence fees, and defend all suits or claims for infringement of any patent rights, and save the Owner and the Engineer harmless of loss or annoyance on account of suit, or claims of any kind for violation or infringement of any letters patent or patent rights, by this Subcontractor or anyone directly or indirectly employed by him or by reason of the use by him or them or any part machine, manufacture or composition of matter on the work, in violation or infringement of such letters patent or rights.

.1 The Owner has the privilege of trial usage of mechanical systems or parts thereof for the purpose of testing and learning operational procedures.

.2 Do not waive any responsibility resulting from trial usage.

.3 Trial usage shall not be construed as acceptance by the Engineer.

.4 Provide and pay for all testing required on the system components where in the opinion of the Engineer, Manufacturer's ratings or specified performance is not being achieved.

1.30 INSTRUCTION TO OWNERS

.1 Where specified elsewhere in the Contract Documents, manufacturers to provide demonstrations and instruction.

.2 Provide instruction to operating staff during regular work hours prior to acceptance and turn-over.

.3 Availability of approved operation and maintenance manuals to the facility operators are mandatory during all training sessions.

.4 Use as-built drawings, audio visual aids, etc. as part of instruction manual.

.5 Where deemed necessary, the Owner may record these demonstrations on videotape for future reference.

.6 Additional sections of the specifications may define and describe training and number of days for start-up of each type of equipment. Utilize the most stringent.

1.31 EXTENDED WARRANTY

.1 Refer to Articles of the General Conditions and Supplementary Conditions for details regarding warranty.

.2 For all mechanical components, provide an extended warranty such that warranty on both components and installation shall be in force for one (1) year from date of Substantial Completion. This extended warranty shall not be altered by temporary use of mechanical equipment.

.3 This general warranty is not to act as a waiver to any warranty specifying a longer period.

Part 2 Products

.1 Not Used.

Part 3 Execution

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the supply and installation of all process valves applicable to the process mechanical piping systems of the lift station.

.2 Conform to Section 01000.

.3 Valves shall be tested in accordance with the Manufacturer's Recommendations.

1.2 SUBMITTALS

.4 The Contractor shall submit shop drawings and product data as follows:

.1 Assembly drawings and material list.
.2 Details of all parts and principal dimensions.
.3 Submit installation manuals before shipment of any equipment.
.4 Submit operation and maintenance manuals 30 days prior to start up.

1.3 SUPPLIERS

.5 All valves and operators of the same type shall be provided by one manufacturer.

Part 2 Products

2.1 BALL VALVES

.1 Ball valves up to 80 mm in wet well:

.1 Two piece Stainless Steel body
.2 Full standard port
.3 Solid Stainless Steel ball
.4 TFE seat and packing
.5 Lever handle
.6 Threaded ends
.7 Kitz, Flowtek, Jenkins 910J, Trueline or approved equal.

2.2 CHECK VALVES

.1 On pump discharge:

.1 Ball check with Class 125 cast iron body and bolted cover
.2 Flanged ends to ANSI B16.1 Class 125
.3 1000 kPa rating (145 psi)
.4 The ball shall be the only moving part, which automatically rolls out of the path of flow providing an unobstructed and "full flow" equal to nominal pipe size
.5 Metal core ball with nitrile rubber vulcanized coating
.6 "O" ring on ball access flange
.7 Sinking ball type

.8 Valve to be epoxy coated

.9 ITT W&WW HDL Type 5087, AVK HDL 5087, or approved equal

2.3 PLUG VALVES

.1 Cast iron body to ASTM A126 Class B; welded nickel seat

.2 Valve shall meet ANSI/AWWA C517

.3 Permanently lubricated radial shaft bearings of 316 SS

.4 Flanges to ANSI-B16.1, Class 125

.5 One piece construction plug c/w EPDM coating

.6 Adjustable packing

.7 Thrust washers of 316 SS and Teflon

.8 Drip tight shut off up to rated working pressure

.9 Pressure rating to 1200 kPa (175 psi) for valves up to 300ø

.10 Fusion bonded epoxy interior and exterior coating. Use flat washers under flange nuts to prevent damage to finish

.11 Minimum open area of:

.1 100% for valves < 100ø

.2 85% for valves <= 400ø

.12 Manual valve actuators shall be as follows and as indicated on the drawings:

.1 Totally enclosed, grease packed gear actuator c/w 50 mm square operating nut. The gear operator shall be oriented as shown on the drawings.

.13 Installation:

.1 For solids-containing fluid horizontal installation, install valve such that the seat is upstream and when open the plug is located at the top; for vertical installation ensure seat is at the top of the valve

.14 Val-Matic Cam-Centric Series 5800R, DeZurik Model PEC (Eccentric), Pratt Ball Centric, Milliken Millcentric, or approved equal

2.4 PLUG VALVE ACCESSORIES

.1 Provide two (2) extension stem kits, one for each valve. Each stem kit shall include a 50 mm square stainless steel socket, 25 mm diameter stainless steel extension stem with 50 mm square stainless steel surface operating nut. Minimum standard to be Type 304L Stainless Steel. Stems shall withstand the maximum operator torques with a safety factor of 1.5.

.2 Provide two (2) floor boxes integral with the top of the lift station, one for each plug valve. Cover to be vandal resistant, marked “S”, bolted or locked.

.3 Provide one (1) standard ductile iron, epoxy coated, removable operating wrench to operate the 50 mm square operating nuts.

2.5 COMBINATION AIR/VACUUM VALVE

.1 Size as shown on drawings with flanged connection conforming to ANSI standards

.2 Suitable for operation on lift station pump discharge header. Refer to Section 40 21 00 – Submersible Solids Handling Pumps for flow criteria

.3 Single conical metal body c/w baked polyester coating maintaining max distance between the liquid and sealing mechanism while minimizing valve height

.4 Double orifice

.5 Vibrations of lower float shall not unseat the smaller, automatic valve

.6 Flushing ball valve

.7 Air and gas shall be discharged and admitted at high velocity throughout the range of 80 kPa differential pressure to the rated working pressure of the valve

.8 All inner metal parts shall be stainless steel

.9 Pressure rating of 1600 kPa (232 psi)

.10 Minimum working pressure of 20 kPa (3 psi)

.11 ARI D-020 series or approved equal

2.6 SHOP FINISHES

.1 All unfinished iron and steel work on the valves shall be thoroughly cleaned and painted.

.2 All valves identified on the drawings as requiring epoxy coating shall be coated on the interior and exterior with Fusion Bonded Epoxy.

.3 Bronze and stainless steel work shall be left unpainted.

.4 Acceptable Product: 3M Scotch-Coat Fusion Bonded Epoxy or approved equal.

Part 3 Execution

3.1 DELIVERY

.1 Provide for unloading and storage of the valves on the site of the Work.

3.2 VALVES AND OPERATORS

.1 Install all valves and operators in strict accordance with manufacturer's shop drawings and instructions.

.2 Install extension stems, stem supports and other accessories as required and as shown on drawings.

.3 If pipe sleeves through roof are not in vertical line with gear operators other than as shown on the drawings, provide universal joints on the extension operating stem for the correction of alignment.

3.3 FIELD PAINTING

.1 Field painting of valves after installation shall only be required to touch up damaged coatings.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the general requirements for supply and installation of all process mechanical piping systems and is supplemented by other specific details shown or specified in the respective piping system section.

1.2 RELATED WORK

.1 Conform to Section 01000.

.2 Process Mechanical, all other sections of Contract Documents.

1.3 REFERENCES

.1 ASTM D2564-20, Specification for Solvent Cements for Poly Vinyl Chloride Plastic Piping Systems

.2 CAN/CSA-B137.3, Rigid Polyvinyl Chloride (PVC) Pipe and Fittings for Pressure Application

.3 CAN/CSA-B137.6, Chlorinated Polyvinyl Chloride (CPVC) Pipe, Tubing, and Fittings for Hot- and Cold- Water Distribution Systems

.4 CAN/CSA-B1800-21, Thermoplastic Nonpressure Piping Compendium

Part 2 Products

2.1 PIPE FOR NON-BURIED SERVICE

.1 Stainless Steel for Process Piping
- .1 ASTM-A778 or A312 Type 304 L pipe
- .2 ASTM-A774 or A-403 Type 304 L fittings
- .3 Minimum Wall Thickness:
  - .1 Schedule 10S
- .4 Vacuum rating: 100 kPa
- .5 Longitudinally welded by Tungsten Inert Gas (TIG) for all sludge treatment piping and/or Metal Inert Gas (MIG) method elsewhere
- .6 Ends prepared for welding or to suit connections as shown on drawings
- .7 Provide flanges where required to connect to valves and equipment and at 3 m maximum spacing on straight runs

2.2 PIPE FITTINGS

.1 Stainless Steel
- .1 Wall thickness to match or exceed line pipe wall
- .2 Elbows to 450 mm shall be smooth flow and manufactured to the requirements of ANSI B16.9.
- .3 Backing flanges to be stainless steel, ANSI-B16.5 Class 150 standard, or ANSI-B16.5 Class 300 where noted on drawings.
- .4 Ends to be prepared to suit piping as required.

.5 Weld-o-lets are acceptable in lieu of reducing tees. Where the reducing tee is for an air release valve the weld-o-let shall provide equivalent volume to the reducing tee.

.6 Fitting ASTM type to match pipe ASTM type.

2.3 FLANGES

.1 Flanges for stainless steel shall be welding neck or slip-on type as shown on the drawings.

.2 Slip-on flanges shall be in accordance with AWWA-C207, and rated for 1035 kPa.

.3 Flanges shall be steel to ASTM-A181, Grade 60, fabricated to ANSI B16.5, rated for 1035 kPa.

.4 Use flat face flanges to connect to cast iron flanges, and raised face flanges to connect to raised face flanges.

.5 Flange class shall be plainly marked on all flanges.

2.4 BOLTS AND NUTS

.1 Bolts and nuts shall be to AWWA C207.

.2 Bolts and nuts shall be stainless steel to ASTM-240 Type 304, hexagonal heads.

.3 Size and length to match flanges and valves.

2.5 FLANGE GASKETS

.1 For flanges, 1.6 mm cloth inserted rubber SBR, Garlock Style 22 or approved alternate for temperatures below 100°C.

.2 Use flat ring gaskets with raised face flanges.

.3 Use full faced gaskets with flat face flanges.

2.6 GROOVED COUPLINGS

.1 Grooved couplings shall be used for jointing standard steel pipe and stainless steel pipe as noted on the drawings.

.2 Grooved couplings shall be in accordance with the recommendations of the Victaulic Company of Canada, Anvil International (Gruvlok) or approved alternative.

.3 For rigid connections in water piping use:
- .1 Victaulic Zero - Flex Style 07.
- .2 Gruvlok Figure 7401.

.4 For flexible couplings allowing for expansion, contraction and deflection use:
- .1 Victaulic 71, Gruvlok Figure 7001 Standard Couplings for maximum working pressures to 3450 kPa.
- .2 Victaulic 77 Gruvlok Figure 7001 Standard Couplings for maximum working pressures in accordance with manufacturer's recommendations.

.5 Coupling gaskets - Grade E-EDPM for water from -34°C to +110°C.

.6 Bolts and nuts - Zinc electroplated, from ASTM-A183 or stainless steel Type 304.

.7 Coupling Materials
.1 Ductile Iron to ASTM-A536 for normal conditions.
.2 Stainless steel Type 304 for corrosive conditions.

2.7 WELDING OUTLETS

.1 Fabricate to the requirements of ANSI-B16.9, ANSI-B16.11 and ANSI-B31.1.

.2 Welded outlets include weldolets, sockolets and thredolets.

2.8 PIPE GROOVES

.1 Standard Steel Pipe – roll or cut grooves to coupling manufacturer's standards. The use of cut grooves shall maintain a minimum pipe work pressure of 1035 kPa.

.2 Light Wall Steel Pipe - roll grooves to coupling manufacturer's standards.

.3 Stainless Steel Pipe - roll grooves to coupling manufacturer's standards.

2.9 GROOVED END FITTINGS

.1 Steel to ASTM A106 Grade B - segmentally welded.

2.10 GROOVED FITTING FLANGES

.1 Use hinged Victaulic Flange Style 341 or Gruvlok Flange Figure 7012 for pipe diameters 300 mm and smaller.

.2 Use four-piece Victaulic Flange Style 341 or Gruvlok Flange Figure 7012 for pipe diameters 350 mm and larger.

2.11 FLEXIBLE PIPE ACCESSORIES

.1 Power Lock Clamp
.1 Provide Power Lock Clamp to connect PVC ridged pipe to fittings.
.2 Clamp to be double bolted stainless steel.
.3 Acceptable product: Kanaline Power Lock Clamp or approved alternative.

.2 Cam-Lock Couplers
.1 Provide female coupler c/w hose shank for attachment to PVC hose.
.2 Provide threaded male adapter for connection to rigid pipe elbow.
.3 Material of construction shall be 316 stainless steel.
.4 Provide Buna "N" gaskets.
.5 Fittings to be rated for a minimum operating pressure of 150 psi.

2.12 FLEXIBLE RUBBER PROCESS PIPE SECTIONS

.1 Double arched butyl rubber expansion joint with multiple plies of polyester or nylon cord and full faced flanges with retaining rings drilled to 150# ANSI standards

.2 32 mm minimum axial compression.

.3 PTFE lined.

.4 Acceptable product: Flexicraft Tefspool PTFE Lined, Proco Products Inc., or approved equal.

2.13 SLEEVE TYPE COUPLINGS

.1 Use only as indicated on the drawings.

.2 Use steel couplings, epoxy shop coated, with stainless steel Type 316 nuts and bolts, and plain grade 27 gaskets.

.3 Couplings to be by Robar, Romac or approved alternative, standard length, standard weight.

.4 Transition couplings to be by Robar, Romac or approved alternative.

.5 Joint harness details shall be in accordance with AWWA Steel Pipe Manual M11.

.6 Design of joint harness shall be based on an operating pressure of 1035 kPa unless otherwise noted.

2.14 PIPE SLEEVES

.1 Special sleeves shall be as shown on the drawings.

2.15 SUPPORTS AND HANGERS - GENERAL

.1 Hangers and supports shall conform to ANSI Code for Pressure Piping B31.1.

.2 Materials, design and manufacture for Pipe Hangers and Support shall be in accordance with ANSI/MSS SP-58.

.3 Hot dip galvanize all supports, hangers, guides, sway braces, restraints, dampeners, bolts, washers and nuts after fabrication and before installation.

.4 Hangers and supports shall be sized to suit the pipe sizes as shown on drawings and as recommended by the manufacturer.

2.16 PIPE SUPPORTS

.1 Wall supports - use Grinnell Fig. 194, Fig. 195, Fig. 199, or Caddy welded steel brackets hot dipped galvanized, or as shown on the drawings.

.2 Pipe saddle supports - use Grinnell Fig. 265 or Caddy 724 adjustable pipe saddle support complete with riser pipe and floor flange.

.3 Strap supports - use Grinnell Fig. 212 or Caddy 450 for PVC pipe. Use stainless steel U-bolts for stainless steel piping. Provide straps for larger pipe as detailed on drawings.

.4 Any part of a hangar or other pipe support in direct contact with stainless steel shall be nylon coated with NCA-1477 nylon thermoplastic 0.5 mm thick or shall be of 316 stainless steel. Provide felt paper between pipe and concrete pipe supports to prevent bonding.

.5 Wall supports for PVC pipe up to 50 mm diameter shall be Grinnell tube strap or approved alternate.

2.17 PIPE HANGERS

.1 For non-insulated steel pipe of 150 mm and smaller use Grinnell Figure CT97C coated adjustable pipe ring complete with hanger rod and expansion case or insert for mounting on concrete surface.

.2 For non-insulated steel pipes to 600 mm use Grinnell Fig. 260 or Caddy 401 adjustable clevis galvanized.

.3 For concrete inserts use Grinnell Fig. 152, Fig. 117 and Fig. 285 to suit service conditions and pipe size.

.4 For ceiling flanges, use Grinnell Fig. 153.

.5 Hanger rods shall be machine threaded both ends and shall be hot dipped galvanized after fabrication.

.6 Spring hangers shall be Grinnell Fig. 80-V or 81-H constant support spring hangers.

.7 Any part of a hanger or other pipe support in direct contact with stainless steel shall be nylon coated with NCA-1477 nylon thermoplastic 0.5 mm thick or shall be of 304 stainless steel. Provide felt paper between pipe and concrete pipe supports to prevent bonding.

2.18 CAST IRON/DUCTILE IRON COATING

.1 All cast iron and ductile iron pipe and fittings for use inside the wet well shall be coated on the interior and exterior with Fusion Bonded Epoxy.

.2 Acceptable Product: 3M Scotch-Coat Fusion Bonded Epoxy or approved equal.

Part 3 Execution

3.1 NUTS AND BOLTS

.1 Install nuts and bolts so that bolts have a minimum of two exposed threads projecting after tightening; with a maximum of 8 threads projecting.

.2 Apply Denso paste to exposed threads, flanges and coupling bolts.

3.2 INSTALLATION OF PIPE AND FITTINGS

.1 Route piping in an orderly manner and maintain proper grades. Install to conserve headroom and interfere as little as possible with use of space. Run exposed piping parallel to walls. Group piping wherever practical at common elevations.

.2 Prior to commencing piping work, examine route for conflicts and notify the Engineer of any conflicts. Obtain approval of the Engineer for any relocations.

.3 Install piping lines to elevations shown on the drawings.

.4 Install all piping parallel to building walls where shown on the drawings.

.5 Determine exact location of each pipe in the field with respect to adjacent and interconnecting piping and equipment.

.6 Install piping to allow for expansion and contraction without unduly stressing pipe or equipment connected.

.7 Provide clearance for proper installation of insulation and for access to valves, air vents, drains and unions.

.8 Install all piping systems in accordance with the ANSI code for pressure piping, B31.1.

.9 Provide temporary bracing and supports to adequately support pipes and fittings during installation.

.10 Where the required piping is not shown on drawings or is shown diagrammatically, the pipes shall be installed in such a way as to conserve head room and interfere as little as possible with the spaces through which they pass.

.11 Make reductions in water pipes with eccentric reducing fittings installed to provide drainage and venting. Top of the fitting shall be flat for water-containing pipes.

.12 Where piping is to connect to equipment, dimensions shown on the drawings are based on catalogue information of first named supplier.

.13 Modify work to suit final dimensions shown on shop drawings for equipment.

.14 Ascertain the correct equipment dimensions before ordering piping closure lengths and fittings. Review of drawings by the Engineer will not relieve the Contractor of his/her obligation in this respect.

3.3 JOINTING PIPES - GENERAL

.1 Clean pipes inside and outside before assembly. Remove welding slag.

.2 Ream pipes and tubes.

.3 Make screwed joints using approved compound or teflon tape applied to male threads.

.4 American National Taper pipe thread must be used for all screwed connections. Remove burrs and chips and ream or file the pipe ends out to size or bore. Not more than two (2) imperfect threads exposed when joint make-up.

.5 Use Teflon tape, red lead and linseed oil or other approved non-toxic joint compound applied to male threads only.

.6 Connect pipes to equipment as shown or specified, without springing the pipes.

.7 Provide complete isolation of dissimilar metals.

.8 Use standard fittings for direction changes.

.9 Follow the recommendations of the manufacturer for jointing pipes and installing couplings and fittings.

3.4 FLANGED JOINTS AND RUBBER GASKET JOINTS

.1 Make rubber gaskets joints in ductile iron pipe, PVC pipe or other pipes in accordance with the manufacturer's instructions. Use appropriate tools to pull joints, to field cut joints and to prepare pipes for joining. After assembly check the gasket position.

.2 Fit flanged joints so that gaskets are bearing uniformly and joints are even. Apply an anti-seize compound to bolt threads and tighten bolts evenly.

3.5 EXPANSION PIECES

.1 Install piping to permit free movement of piping caused by thermal expansion and contraction except where it is anchored.

.2 Provide for expansion and contraction by installing suitable expansion pieces as is necessary or where indicated.

.3 Provide expansion pieces having ratings equivalent to the test pressures specified for the particular piping system and wetted surfaces of material similar to that of the piping system.

.4 Design expansion pieces for the lengths of straight runs shown and the temperature differentials specified.

.5 Provide anchors and guides where necessary to direct expansion into expansion pieces.

3.6 INSTALLATION OF SUPPORTS AND HANGERS

.1 Support all piping after alignment and before tightening joints.

.2 Do not move pipe after tightening joints.

.3 Provide all hangers, supports, anchor bolts, washers and nuts to support pipes at the lines and elevations indicated and/or as detailed on the drawings.

.4 Provide inserts in concrete, concrete piers and anchor bolts as required. Provide reinforcing bars in concrete for inserts carrying pipe over 100 mm in diameter.

.5 Bolt base flanges to the floors or to concrete.

.6 Provide all necessary sway braces, dampeners, flexible hoses and restraints to eliminate all movements of piping due to vibration. Install additional braces and anchors as necessary to eliminate vibrations.

.7 Provide hangers, supports, anchors, guides, dampeners, flexible hoses, restraints and sway braces that will cope with the loads and thrust forces from all directions so that all pipe joints will function and thrust is not transferred to the equipment to which the pipe is connected.

.8 Maximum hanger spacing and minimum rod size shall be in accordance with the following:

Pipe Size	Rod Size	Maximum Spacing Steel	Maximum Spacing P.V.C.
up to 25 mm	10 mm	1200 mm	1200 mm
25 - 50 mm	10 mm	1800 mm	1800 mm
65 - 90 mm	12 mm	2400 mm	2100 mm
100 - 125 mm	16 mm	2400 mm	2100 mm
150 mm	20 mm	3600 mm	2400 mm
200 - 300 mm	22 mm	5500 mm	2400 mm
350 and up	25 mm	6500 mm	2800 mm

.9 Install sufficient hangers and supports to provide an adequate safety factor as outlined in ANS1-B31.1.

.10 Drilling into concrete, and using expansion type inserts will be permitted only on approval of the Engineer.

3.7 PIPES THROUGH FLOORS AND WALLS

.1 Provide pipe sleeves where pipes pass through floors and walls.

.2 Install sleeves as detailed on the drawings.

.3 Remove coating from pipes to be cast in concrete to permit a good bond.

.4 For stainless steel pipe passing through concrete use stainless steel sleeves. Coat surfaces of stainless steel in contact with concrete, with bitumastic.

.5 There shall be no direct contact between structural steel and stainless steel.

.6 Seal space between sleeves and pipes with modular seals or non-hardening mastic – Duraseal-A or approved alternative, as detailed on the drawings.

3.8 PRESSURE AND LEAKAGE TESTING

.1 Leaks in screwed fittings shall be corrected by remaking joints; leaks in welded joints shall be cut out and rewelded; leaks in PVC joints shall be cut out and reglued; leaks in copper lines shall be corrected by remaking joints. Caulking will not be permitted.

.2 Leaks in valves shall be rectified by replacement of the valve.

3.9 CLEANING

.1 Clean all pipes, fittings and miscellaneous items after installation.

.2 Remove all materials from pipes, whatever their origin, by flushing with water, blowing with air and dismantling and manually cleaning.

.3 Prevent entrance of foreign materials from pipes to equipment or pumps.

3.10 SHOP FINISHES

.1 All cast iron and ductile iron pipe and fittings shall be shop prepared, primed and coated as specified in this section.

3.11 FIELD PAINTING

.1 Field painting of pipe and fitting shall only be required to touch up damaged coatings.

END OF SECTION

Part 1 General

1.1 DESCRIPTION

.1 This section specifies the supply, delivery and installation of submersible solids handling pumps with accessories.

.2 Included with each pump shall be:

- .1 Submersible pump and motor
- .2 Pump discharge elbow
- .3 Guide rails c/w support base
- .4 Guide rail intermediate and upper brackets
- .5 Power and control cables
- .6 Anchor bolts
- .7 Chains, cables, and lifting accessories
- .8 Chain hooks / cable holding clamps
- .9 Level sensing devices
- .10 Level control supports
- .11 All necessary bolts, nuts, gaskets and couplings to assemble two complete pumping units
- .12 Lifting davit, socket, and chain hoist
- .13 A minimum of one (1) working day of supervision of installation and commissioning by pump supplier

.3 Pumps shall be delivered in complete, assembled units.

.4 All equipment listed in 1.1.2, above, shall be sourced from a single supplier.

1.2 SUBMITTALS

.1 The pump supplier shall submit all shop drawings and maintenance and installation manuals to the Contractor.

.2 The Contractor shall submit to the Engineer four (4) copies of bound indexed operation and maintenance manuals in accordance with Section 01000.

.3 Submittals shall include:

- .1 Type, manufacturer, and general description.
- .2 General outline drawings showing clearly all general and essential dimensions.
- .3 Descriptions and specifications of various components including:
  - .1 Pump impeller.
  - .2 Pump casing.
  - .3 Wearing rings.
  - .4 Discharge fittings.
  - .5 Accessories.
- .4 Pump characteristics curves showing efficiency, power requirements, pump capacities at various heads, curve number, impeller diameter, and rated speed.

.5 Data as follows:

.1 Power requirements, voltage, motor power output.

.2 Maximum solids size.

.3 Total mass of pump and motor.

.4 Level controls.

.5 Pump controls.

.6 Installation details

1.3 GENERAL REQUIREMENTS

.1 The pump supplier shall be responsible for the design, fabrication, assembly in factory and testing of the equipment. The pump supplier shall supply all necessary shop drawings and installation and maintenance manuals for the Contractor. The Contractor shall be responsible for taking delivery of the equipment and assembly (as required) and installation of the equipment to produce an operational pumping system including pump controls.

.2 For supply and installation of the pump control panel, refer to the Contract Documents.

1.4 QUALITY ASSURANCE

.1 The pump manufacturer shall check the pump system and the intended pump conditions.

.2 If the pump manufacturer has concerns regarding the satisfactory operation of his equipment under the required conditions, the concerns shall be submitted in writing to the Engineer.

1.5 REFERENCES

.1 Products provided under this specification must comply with all regulations and codes in effect in Ontario.

.2 Electrical work shall be in accordance with the Canadian Electrical Code and with applicable standards of the Electrical and Electronic Manufacturers Association of Canada (EEMAC) and the Canadian Standards Association (CSA).

.3 Hydraulic Efficiency and Pump Impeller tolerances shall conform to the Standards of the Hydraulic Institute.

.4 The pump / motor assembly shall have CSA approval as one unit, per CSA standard C22.2-108. Proof of this approval shall be submitted by the pump manufacturer with the approval drawings. An approval of the motor unit only will not be acceptable.

.5 The pump / motor shall also be approved by CSA for service in Class1, Division II, Groups A, B, C or D hazardous locations.

1.6 PERMITS

.1 The Contractor shall obtain permits and coordinate power supply, inspections, and connection with Hydro One.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

.1 Deliver products to the site, and handle and store them to avoid damage to any components.

.2 Provide dry storage areas and follow the manufacturer's recommendations for storage and handling. Rotate moving parts monthly during storage.

Part 2 Products

2.1 DESCRIPTION AND CHARACTERISTICS

.1 Pumps shall be non-clog submersible solids handling type to pump raw sewage. The pump system shall be as manufactured by Xylem, ABS, or approved equal.

.2 Pump and motor shall be produced by the same manufacturer.

.3 The pumping units shall be described briefly:

Service	**Duplex Lead/Lag**
Location	Pump Station Wet Well
No. of Units	2
Rated Capacity (each, at max static head)	17.9 L/s @ 7.5 m TDH (284 USGPM @ 11 psi TDH)
Static Head	Ranging from 5.7 m to 6.9 m
Best Efficiency Point	Shall be within 100% to 125% of flow at rated capacity
NPSHr @ Rated Capacity	Less than 5.0 m
Max RPM (motor)	1800
Minimum Overall Efficiency @ Rated Capacity	54 %
Discharge	100 mm
Pump Model	Xylem NP 3102 MT 3~ Adaptive 465
Pump Motor	Max 3.7 kW, 600 V, 3 phase, 60 Hz submersible motor
Drive Type	Constant Speed

2.2 PUMP DESIGN

.1 The pump(s) shall be automatically and firmly connected to the discharge connection, guided by guide bars extending from the top of the wet well to the discharge connection.

.2 There shall be no need for personnel to enter the wet well to remove or reinstall the pumps.

.3 Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal-to-metal, watertight contact.

.4 No portion of the pump shall bear directly on the sump floor.

.5 Provide lifting lugs for full weight of pump and motor.

2.3 PUMP CONSTRUCTION

.1 The pumps shall be submersible, min. CEC Class I, Div II, non-clog, solids handling type with vane impeller.

.2 Pump volute, motor and seal housing to be high quality cast-iron conforming to ASTM A-48, Class 35 B.

.3 All external mating parts to be machined and sealed with O-rings.

.4 All fasteners or hardware including the motor nameplate exposed to the pumped liquid shall be stainless steel. Pump and motor shaft shall be stainless steel, one piece.

.5 Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. In the case of a leak, an alarm shall stop the pump before the fluid comes into contact with the lower bearings, or the stator. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable.

.6 The lubricant chamber shall prevent overfilling and shall provide capacity for lubricant expansion. The seal lubricant chamber shall have one drain and one inspection plug that are removable and accessible from the exterior of the motor unit. The seal system shall not reply upon the pumped media for lubrication. Provide removable inspection plugs.

.7 Replaceable case wearing ring to be bronze.

.8 All rotating components of the pump shall be statically and dynamically balanced as an assembled unit and shall be such as to produce a minimum vibration under service conditions.

.9 The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row, or sleeve lower bearings are not acceptable.

2.4 MOTORS

.1 The pump motor shall be a premium efficiency NEMA-B design induction type with a squirrel cage rotor, shell type design and be housed in an air filled, watertight chamber.

.2 The rotor bars and short circuit rings shall be made of aluminum.

.3 The motor shall be capable of withstanding at least 15 evenly spaced starts per hour.

.4 The motor shall be designed for continuous operation in up to a 40°C (104°F) ambient temperature and shall have a NEMA Class B maximum operating temperature rise of 80°C (176°F).

.5 The motor shall have a voltage tolerance of +/- 10%.

.6 The motor service factor (combined effect of voltage, frequency and specific gravity) shall be 1.15.

.7 Thermal switches shall be embedded in the stator end coils, one per phase winding, to monitor the stator temperature. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the motor control panel. At 125º C (260°F) the thermal switches shall open, stop the motor and activate an alarm.

.8 A leakage sensor shall be included to detect water in the stator chamber. When activated, the sensor will stop the motor and send an alarm both local and/or remote. Use of voltage sensitive solid-state sensors and trip temperature above 140º C (284º F) shall not be allowed.

.9 The thermal switches and leakage sensor shall be connected to a Control and Status monitoring unit mounted in the control panel.

.10 Motor shall be identified by a manufacturer's rating nameplate in permanently inscribed material attached to the unit.

.11 Motor winding, rotor and bearings to be in a sealed submersible type housing, with moisture sensing probe.

.12 Motors shall be capable of continuous operation with motor only partially submerged.

.13 Bearings to be factory pre-lubricated for low maintenance and bearing life shall be not less than AFBMA B-10 Life – 70,000 hours.

.14 A motor performance chart shall be provided exhibiting curves for motor torque, current, power factor, input/output kW and efficiency. The chart shall also include data on motor starting and no-load characteristics.

2.5 IMPELLER

.1 The impeller shall be dynamically balanced, semi-open, multi-vane, back swept, screw-shaped, non-clog design.

.2 The impeller leading edges shall be mechanically self-cleaned automatically upon each rotation as they pass across a spiral groove located on the volute suction.

.3 The screw-shaped leading edges of the impeller shall be hardened to Rc 45 and shall be capable of handling solids, fibrous materials, heavy sludge and other matter normally found in wastewater.

.4 The screw shape of the impeller inlet shall provide an inducing effect for the handling of up to 5% sludge and rag-laden wastewater.

.5 The impeller to volute clearance shall be readily adjustable by the means of a single trim screw.

.6 The impellers shall be locked to the shaft, held by an impeller bolt and shall be coated with alkyd resin primer.

2.6 CABLES

.1 The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal.

.2 Power cables shall be sized to match the pump supplied and be easily replaced.

.3 The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top.

.4 The power cables shall be of sufficient length so that no splicing is required between the junction box/disconnect and the pump. Allow for slack in the cable.

2.7 SYSTEM ACCESSORIES

.1 Pump lifting / guide rail system shall be designed to allow removal of the pumps without personnel entering the wet well and without disturbing the discharge piping. The lifting system shall be in accordance with applicable ASTM or ISO standards.

.2 All accessories (guide rails, supports, lifting cables, sway control rings, etc.) installed within the wet well shall be stainless steel.

.3 Provide one (1) manual type chain hoist to match pump weights.

.4 Provide one (1) removable lifting davit with suitable capacity c/w one (1) floor mounted davit socket.

2.8 LIQUID LEVEL CONTROL

.1 See Division 25 – Integrated Automation.

2.9 PUMP CONTROL

.1 See Division 25 – Integrated Automation.

2.10 ALARMS AND MONITORS

.1 See Division 25 – Integrated Automation.

2.11 FINISHES

.1 The submersible pumps shall be shop primed and shop finished on all exterior surfaces.

2.12 SPARE PARTS

.1 Provide one (1) set of O-rings and one (1) set of mechanical seals for each pump.

Part 3 Execution

3.1 INSTALLATION

.1 Follow the manufacturer's recommended installation details and procedures supplemented by details on the drawings.

.2 Install all equipment in a neat, workmanlike manner so that connections and disconnections can be easily made with parts accessible for inspections, maintenance and repairs.

.3 Install at correct elevations, true, square, plumb and level and provide all shims required.

.4 Apply protection so that all anchor bolts, shims and miscellaneous metals are fully corrosion protected.

3.2 CLEAN UP

.1 Clean up and remove all waste prior to start-up, and touch up all surfaces as required so that all finishes are in an unmarred factory condition.

3.3 START UP

.1 Check the final installation and the operation of each component. Check the interconnection of wiring for alarms and controls.

.2 Coordinate an inspection and supervision of start up by the equipment supplier and provide to the Engineer a written certification by the supplier that the equipment is installed and operating in accordance with the manufacturer’s standards and design

conditions, and that the warranty is in effect as per Contract requirements. This report shall include all field start-up checks performed by the pump supplier.

3.4 TRAINING

.1 Training must be provided by a factory certified trainer.

.2 The Contractor shall coordinate the training session for the Owner's operating personnel, the Engineer and the pump manufacturer.

.3 A one (1) day seminar of at least 4 hours duration shall be provided for the Owner's operating staff. The training shall cover basic pump maintenance and care and detailed O&M procedures.

3.5 TESTING

.1 Field test all pumps in presence of the Engineer to demonstrate the installation is correctly completed and all pumps are operating satisfactorily without vibration.

.2 Tests shall be undertaken by the manufacturer's representative. A complete report of this test shall be submitted (in duplicate) directly to the Engineer.

.3 Testing shall include a minimum of two draw down tests per pump, each with a duration of 60 seconds. Additional draw down tests shall be at the Engineer's discretion.

.4 Contractor shall coordinate and pay for supply of media to be pumped during testing.

END OF SECTION

KEY PLAN

SITE PLAN

BOREHOLE TABLE			
ID	NORTHING	EASTING	ELEVATION
BH25-01	5512844.0	511787.0	373.7
BH25-02	5512676.0	511789.0	374.6
BH25-03	5512591.0	511786.0	376.6
BH25-04	5512561.0	511783.0	376.2
BH25-05	5512523.0	511788.0	375.0
BH25-06	5512420.0	511792.0	372.0
BH25-07	5512299.0	511785.0	371.3
BH25-08	5512174.0	511784.0	373.8
BH25-09	5512186.0	511903.0	373.0
BH25-10	5512179.0	512009.0	372.5
BH25-11	5512093.0	511761.0	N/A
UTM ZONE 15N NAD83			

Stantec

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	By	Appd	YYYY.MM.DD
Issued			
File Name: 161414649_SOUTH_VAN_HORNE_BOREHOLE_PLAN	-	AT	
Project Number: 161414649	Dwn.	Dsgn.	Chkd. YYYY.MM.DD

LEGEND

BH25-01 BOREHOLE LOCATION

Client/Project
CITY OF DRYDEN

SOUTH VAN HORNE ROAD RECONSTRUCTION

Project No.
161414649

Title
BOREHOLE LOCATION PLAN

Revision: -
Date: 2025.07.24
Reference Sheet: 1 of 1
Figure No.: 1

Stantec

BOREHOLE RECORD

BH25-01

CLIENT: **City of Dryden**

PROJECT: **South Van Horne Road Reconstruction and Lift Station**

LOCATION: **Dryden, ON**

DATE BORED: **June 02 2025**

BH COORDINATES [UTM Zone 15U] 5512844 N 511787 E

PROJECT NO.: **161414649**

BH ELEVATION: **373.7m**

DATUM: **NAD83**

WATER LEVEL: **2.0 m on June 2, 2025**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0	373.7							
	373.6	**ASPHALT:** 75 mm thick						
		BASE: brown poorly graded sand with silt		AS	1			
1				SS	2	300	21	Sieve at 0.8 m G S Fines 1% 92% 7%
	372.2							
2		Firm grey **LEAN CLAY (CL)** with sand		SS	3	600	5	
				SS	4	600	2	
3		- stiff below 3.0 m		SS	5	600	5	
4	369.7							

UNDRAINED SHEAR STRENGTH, Cu (kPa)

▲ LABORATORY TEST ◆ FIELD VANE TEST

★ POCKET PENETROMETER □ POCKET SHEAR VANE

50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

✖ SPT (N-value) BLOWS/0.3m

Water Content (%) and Blow Count

10 20 30 40 50 60 70 80

BACKFILL

ELEVATION (m): 373 372 371 370 369 368 367 366 365 364 363 362

End of Borehole

- Moderate groundwater seepage was observed at a depth of 2.0 m.
- Soil sloughing was observed at a depth of 1.9 m.
- Borehole terminated at a depth of 4.0 m.

Water Level Observed During Drilling

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.

Drilling Method: SSA/HSA

Completion Depth: 4 m

Logged By: AT

Reviewed By: BK

Page 1 of 1

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BOREHOLE RECORD

BH25-02

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 02 2025**

BH COORDINATES [UTM Zone 15U] 5512676 N 511789 E
WATER LEVEL: **1.8 m on June 2, 2025**

PROJECT NO.: **161414649**
BH ELEVATION: **374.6m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0	374.6							
	374.5	**ASPHALT:** 60 mm thick		AS	1			
	374.1	**BASE:** brown poorly graded sand with silt						
		Very stiff grey **LEAN CLAY (CL)** with sand						
1				SS	2	100	11	
2				SS	3	100	14	
3				SS	4	150	13	
				SS	5	300	7	
4	370.6	**End of Borehole**						
		• Moderate groundwater seepage was observed at a depth of 1.8 m.						
		• Soil sloughing was observed at a depth of 0.4 m.						
		• Borehole terminated at a depth of 4.0 m.						

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL

ELEVATION (m): 374 373 372 371 370 369 368 367 366 365 364 363

▽ Water Level Observed During Drilling

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA/HSA
Completion Depth: 4 m

Logged By: AT
Reviewed By: BK
Page 1 of 1

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BOREHOLE RECORD

BH25-03

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 02 2025**

BH COORDINATES [UTM Zone 15U] 5512591 N 511786 E
WATER LEVEL: **N/A**

PROJECT NO.: **161414649**
BH ELEVATION: **376.6m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	RECOVERY (mm) or TCR %	N-VALUE or RQD %	OTHER TESTS / REMARKS	BACKFILL
0	376.6								
	376.5	**ASPHALT:** 60 mm thick		AS	1				
		BASE: brown poorly graded sand with silt		AS	2				
1	375.5								

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

End of Borehole
- No groundwater seepage or soil sloughing was observed upon completion of augering.
- Power auger refusal encountered at 1.1 m on suspected bedrock.

ELEVATION (m): 376 375 374 373 372 371 370 369 368 367 366 365

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA
Completion Depth: 1.1 m

Logged By: AT
Reviewed By: BK
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BOREHOLE RECORD

BH25-04

CLIENT: **City of Dryden** | BH COORDINATES | PROJECT NO.: **161414649**

PROJECT: **South Van Horne Road Reconstruction and Lift Station** | [UTM Zone 15U] | BH ELEVATION: **376.2m**

LOCATION: **Dryden, ON** | 5512561 N 511783 E | DATUM: **NAD83**

DATE BORED: **June 02 2025** | WATER LEVEL: **N/A**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES: TYPE	SAMPLES: NUMBER	SAMPLES: RECOVERY (mm) or TCR %	SAMPLES: N-VALUE or RQD %	OTHER TESTS / REMARKS	UNDRAINED SHEAR STRENGTH, Cu (kPa) / WATER CONTENT & ATTERBERG LIMITS	BACKFILL	ELEVATION (m)
0	376.2										376
	376.1	**ASPHALT**		AS	1						
	375.9	**BASE:** brown poorly graded sand with silt									
1		**End of Borehole** • No groundwater seepage or soil sloughing was observed upon completion of augering. • Power auger refusal encountered at 0.3 m on bedrock.									375
2											374
3											373
4											372
5											371
6											370
7											369
8											368
9											367
10											366
11											365
12											

UNDRAINED SHEAR STRENGTH, Cu (kPa)

▲ LABORATORY TEST ◆ FIELD VANE TEST

★ POCKET PENETROMETER □ POCKET SHEAR VANE

50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L

✖ SPT (N-value) BLOWS/0.3m

Water Content (%) and Blow Count

10 20 30 40 50 60 70 80

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd. | Logged By: AT

Drilling Method: SSA | Reviewed By: BK

Completion Depth: 0.3 m | Page 1 of 1

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BOREHOLE RECORD

BH25-05

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 02 2025**

BH COORDINATES [UTM Zone 15U] 5512523 N 511788 E
WATER LEVEL: **3.0 m on June 2, 2025**

PROJECT NO.: **161414649**
BH ELEVATION: **375.0m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0	375.0							
	374.9	**ASPHALT:** 60 mm thick						
		BASE: brown silty sand		AS	1			Sieve at 0.2 m G S Fines 1% 81% 18%
1								
2				AS	2			
	372.0							
3		Grey **LEAN CLAY (CL)** with sand		AS	3			
4	370.7							
		End of Borehole • Moderate groundwater seepage was observed at a depth of 3.0 m. • Soil sloughing was observed at a depth of 3.0 m. • Power auger refusal encountered at 4.3 m suspected bedrock.						
5								
6								
7								
8								
9								
10								
11								
12								

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL

ELEVATION (m): 375 374 373 372 371 370 369 368 367 366 365 364 363

▽ Water Level Observed During Drilling

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA
Completion Depth: 4.3 m

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BOREHOLE RECORD

BH25-06

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 02 2025**

BH COORDINATES [UTM Zone 15U] 5512420 N 511792 E
WATER LEVEL: **N/A**

PROJECT NO.: **161414649**
BH ELEVATION: **372.0m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0	372.0							
	371.9	**ASPHALT:** 60 mm thick		AS	1			
	371.8	**BASE:** brown silty sand						
		Very stiff grey **LEAN CLAY (CL)** with sand						
1				SS	2	130	31	
		- 60 mm thick layer of crushed gravel and sand at 1.3 m						
2				SS	3	100	22	
				SS	4	150	13	
3				SS	5	100	12	
4	368.0							

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL

End of Borehole
- No groundwater seepage was observed upon completion of augering.
- Soil sloughing was observed at a depth of 3.5 m.
- Borehole terminated at a depth of 4.0 m.

ELEVATION (m): 372 371 370 369 368 367 366 365 364 363 362 361 360

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA/HSA
Completion Depth: 4 m

Logged By: AT
Reviewed By: BK
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BOREHOLE RECORD

BH25-07

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 03 2025**

BH COORDINATES [UTM Zone 15U] 5512299 N 511785 E
WATER LEVEL: **1.5 m on June 3, 2025**

PROJECT NO.: **161414649**
BH ELEVATION: **371.3m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	RECOVERY (mm) or TCR %	N-VALUE or RQD %	OTHER TESTS / REMARKS	BACKFILL
0	371.3			AS	1				
	371.2	**ASPHALT**							
	371.2	**BASE:** brown silty sand							
1		Very soft grey **LEAN CLAY (CL)** with sand		AS	2				
		- boulder encountered at 1.2 m							
2				AS	3			Sieve/Hydro at 1.5 m G 0%, S 15%, M 60%, C 25%	
3		- very stiff below 3.0 m							
4				AS	4				
	366.8								

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

End of Borehole
- Minor groundwater seepage was observed at a depth of 1.5 m.
- Soil sloughing was observed at a depth of 4.3 m.
- Borehole terminated at a depth of 4.5 m.

ELEVATION (m): 371, 370, 369, 368, 367, 366, 365, 364, 363, 362, 361, 360

▽ Water Level Observed During Drilling

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA
Completion Depth: 4.5 m

Logged By: AT
Reviewed By: BK
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BOREHOLE RECORD

BH25-08

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 03 2025**

BH COORDINATES [UTM Zone 15U] 5512174 N 511784 E
WATER LEVEL: **2.0 m on June 3, 2025**

PROJECT NO.: **161414649**
BH ELEVATION: **373.8m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0	373.8							
	373.7	**ASPHALT**		AS	1			
		BASE: brown silty sand		AS	2			
	373.1	Stiff grey **LEAN CLAY (CL)** with sand		SS	3	250	8	
1		- very stiff below 1.5 m		SS	4	200	13	
2		- 60 mm thick layer of crushed gravel and sand at 2.2 m		SS	5	150	55	
3				SS	6	150	34	Sieve/Hydro at 3.0 m G 1% S 2% M 47% C 50%
	369.8							
4		**End of Borehole** • Minor groundwater seepage was observed at a depth of 2.0 m. • Soil sloughing was observed at a depth of 3.0 m. • Borehole terminated at a depth of 4.0 m.						

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL

ELEVATION (m): 373 372 371 370 369 368 367 366 365 364 363 362

▽ Water Level Observed During Drilling

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA/HSA
Completion Depth: 4 m

Logged By: AT
Reviewed By: BK
Page 1 of 1

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BOREHOLE RECORD

BH25-09

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 03 2025**

BH COORDINATES [UTM Zone 15U] 5512186 N 511903 E
WATER LEVEL: **N/A**

PROJECT NO.: **161414649**
BH ELEVATION: **373.0m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0	373.0	**BASE:** brown silty sand		AS	1			
				AS	2			
	372.3	Stiff grey **LEAN CLAY (CL)** with sand		SS	3	150	6	
1				SS	4	130	10	
2		- very stiff below 2.0 m		SS	5	200	13	
3				SS	6	130	9	
4	369.0	**End of Borehole** • No groundwater seepage or soil sloughing was observed upon completion of augering. • Borehole terminated at a depth of 4.0 m.						

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa
WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL

ELEVATION (m): 373 372 371 370 369 368 367 366 365 364 363 362 361

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA/HSA
Completion Depth: 4 m

Logged By: AT
Reviewed By: BK
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Stantec

BOREHOLE RECORD

BH25-10

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 03 2025**

BH COORDINATES [UTM Zone 15U] 5512179 N 512009 E
WATER LEVEL: **1.5 m on June 3, 2025**

PROJECT NO.: **161414649**
BH ELEVATION: **372.5m**
DATUM: **NAD83**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	RECOVERY (mm) or TCR %	N-VALUE or RQD %	OTHER TESTS / REMARKS
0	372.5							
0		**BASE:** grey silty sand		AS	1			
	371.8			AS	2			
1		Grey **LEAN CLAY (CL)** with sand		AS	3			
2				AS	4			
3				AS	5			
4	368.0							
5		**End of Borehole**						
		• Minor groundwater seepage was observed at a depth of 1.5 m.						
		• Soil sloughing was observed at a depth of 1.5 m.						
		• Borehole terminated at a depth of 4.5 m.						

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL

ELEVATION (m): 372 371 370 369 368 367 366 365 364 363 362 361

▽ Water Level Observed During Drilling

BACKFILL SYMBOL: ASPHALT, GROUT, CONCRETE, BENTONITE, DRILL CUTTINGS, SAND, SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA
Completion Depth: 4.5 m

Logged By: AT
Reviewed By: BK
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BOREHOLE RECORD

BH25-11

CLIENT: **City of Dryden**
PROJECT: **South Van Horne Road Reconstruction and Lift Station**
LOCATION: **Dryden, ON**
DATE BORED: **June 03 2025**

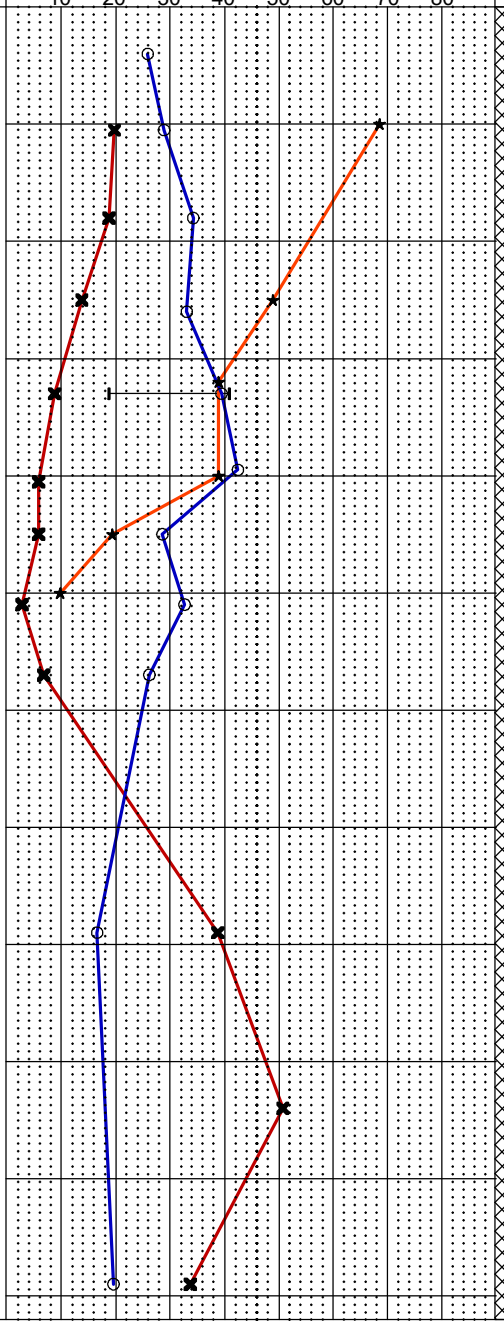
BH COORDINATES [UTM Zone 15U] 5512093 N 511761 E
PROJECT NO.: **161414649**
BH ELEVATION: **N/A**
DATUM: **NAD83**
WATER LEVEL: **3.5 m on June 3, 2025**

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION (USCS)	STRATA PLOT	SAMPLES TYPE	SAMPLES NUMBER	SAMPLES RECOVERY (mm) or TCR %	SAMPLES N-VALUE or RQD %	OTHER TESTS / REMARKS
0		Brown **ROOTMAT**						
		Very stiff brown **LEAN CLAY (CL)** with silt		AS	1			
1				SS	2	100	20	
2				SS	3	100	19	
				SS	4	200	14	
3		- stiff below 3.0 m		SS	5	600	9	Sieve/Hydro at 3.0 m G S M C 1% 2% 47% 50%
4				SS	6	600	6	
				SS	7	600	6	
5		- firm below 4.6 m Loose grey **SILT (ML)** - some clay		SS	8	600	3	Sieve/Hydro at 4.8 m G S M C 0% 3% 74% 23%
				SS	9	600	7	
6								
7								
8		Dense brown **Silty SAND (SM)**		SS	10	450	39	Sieve at 7.6 m G S Fines 0% 56% 44%
9								
10				SS	11	0	51	
11				SS	12	100	34	
12		**End of Borehole** • Minor groundwater seepage was observed at a depth of 3.5 m. • Soil sloughing was observed at a depth of 5.4 m. • Borehole terminated at a depth of 11.2 m.						

UNDRAINED SHEAR STRENGTH, Cu (kPa)
▲ LABORATORY TEST ◆ FIELD VANE TEST
★ POCKET PENETROMETER □ POCKET SHEAR VANE
50 kPa 100 kPa 150 kPa 200 kPa

WATER CONTENT & ATTERBERG LIMITS W_P W W_L
✖ SPT (N-value) BLOWS/0.3m
Water Content (%) and Blow Count
10 20 30 40 50 60 70 80

BACKFILL



ELEVATION (m)

▽ Water Level Observed During Drilling

BACKFILL SYMBOL
ASPHALT GROUT CONCRETE
BENTONITE DRILL CUTTINGS SAND SLOUGH

Drilling Contractor: RPM Drilling Ltd.
Drilling Method: SSA/HSA
Completion Depth: 11.2 m

Logged By: AT
Reviewed By: BK
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PROJECT SITE PHOTOS

Looking north from Van Horne Landing Dock

Van Horne Landing Dock

Looking north towards Claybanks intersection

Looking north towards Claybanks intersection

Van Horne/Claybanks intersection looking east

Van Horne/Claybanks intersection looking south

Van Horne/Claybanks intersection looking west

Van Horne/Claybanks intersection looking north

On Claybanks looking west toward Van Horne/Claybanks intersection

On Claybanks looking east toward lake

At the end of Claybanks looking west

Looking east at the end of Claybanks

Van Horne approx. 0+510 looking north towards Lakeside Drive

Van Horne approx. 0+325 looking south to Claybanks intersection

Van Horne looking north at Lakeside Drive intersection

Van Horne/Lakeside Drive intersection looking north

Van Horne/Lakeside Drive intersection looking east down Lakeside Dr.

Van Horne/Lakeside Drive intersection looking south

Van Horne/Lakeside Drive intersection looking north

Van Horne at approx. 0+300 looking northeast

Van Horne at approx. 0+280 looking north towards Ingall Dr.

Van Horne/Ingall intersection looking south

Van Horne/Ingall Dr. intersection looking east

Van Horne at approx. 0+200 looking north

Van Horne at approx. 0+160 looking north along east side of roadway

Van Horne at approx. 0+120 looking north at retaining wall

Laura Howe Marsh outlet looking west from Van Horne

Van Horne at approx. 0+150 looking north along west side of roadway

Van Horne looking north at Wabigoon Dr. intersection

Van Horne/Wabigoon Dr. intersection looking west

Van Horne/Wabigoon Dr. intersection looking east

Van Horne/Wabigoon Dr. intersection looking south